THE GLASS INDUSTRY

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MAKING MOULDS AT SWINDELL BROTHERS INC.

Although the production tonnage of the Swindell Brothers plant, in Baltimore, is comparatively moderate, the small size, large variety and great number of items require a sizable, well-equipped shop for the manufacture of new moulds and the repair of old ones.

A plain, ordinary glass bottle in production at Swindell Brothers, Baltimore, would be an out-of-the-ordinary occurrence. Many Swindell bottles run to special and bizarre shapes with all kinds of decorative flutes, spirals and grooves. Even the top finishes are not ordinary, since many are fitted for glass stoppers and others are furnished for screw closures of various kinds. Such bottles and glass stoppers form the greater part of Swindell production, but there is also quite a line of specialties, such as book-ends, etc., which add to the variety of articles produced in this plant.

These conditions alone would seem to present enough of a problem from the mould-making standpoint, but other complications are added by the fact that some items are manufactured on automatic machines, some are hand-blown and others are hand-pressed. The automatic machines are Lynch type LA or type B, modified somewhat to suit the requirements of this type of production. Hand blank and blow moulds, of course, run into almost endless variety, and the same is true of hand press moulds.

As in the case of many mould departments in glass factory organizations, the Swindell shop has grown up

Fig. 1. This versatile and special machine was built by the Swindell mould shop superintendent and is used for shaping glassware models out of Catalin or other transparent plastic.

Fig. 2. Mould castings are stored in convenient racks. This view also shows the operation of facing a mould half on the 24-in. Gould & Eberhardt shaper.

Fig. 3. A few Swindell hand blow moulds have been cast to size, as in this case. For finish, the contours of the castings are carefully polished and finally chrome-plated. The finished bottle appears at the right.

Fig. 4. In this lathe operation the operator is facing and counter-boring one end of a bottle mould.

Fig. 5. The set-up for this lathe job is practically the same as in Fig. 4, but the operator is here performing a boring operation.

Fig. 6. The tool carriage of this lathe is fitted with a motor-driven milling attachment, used for milling threads in the neck-ring.

with the requirements of the plant and, like many others, its organization and development has centered around the skill and abilities of an expert mould-making machinist. At Swindell's this man is E. L. Wolff, mould shop superintendent, who is no doddering graybeard of an old-time mould-maker, but rather a dynamic, dark-haired chap with a thorough understanding of all phases of mould work and both eyes open to modern developments in his field. The shop now employs a total of 23 men and handles all Swindell mould requirements, from the design and preparation of new models, through the actual manufacture of the moulds and finally to the repair and maintenance of moulds in production.

Consideration of a completely-integrated mould department of this type always brings up the question as to whether it is more practical and economical for a glass plant to make and maintain its own moulds or to depend on the contract shops for this service. As a matter of fact, there is probably no categorical answer to this question that will fit all cases. Local conditions in a particular plant must govern mould-making policies. At Swindell's, special conditions of product size and design and of ware forming operations seem to point to the economy of a well-equipped mould department. Some plant mould shops have, of course, grown up without regard to the possible economies and advantages of contract mould-shop service, but the dividing line beyond which the economy of the plant mould department gives way to the contract shop will always be hard to determine.

Before considering the operations performed in the Swindell shop, it might be well to look at the major items of machine tool and other equipment with which the department is furnished. All of the machine tools are located on the same floor and, with a few exceptions, all are driven from a lineshaft which passes down the center of the long room. In the lathe department there are a total of eight machines, ranging in size from 14-in. to 20-in. swing. Of these lathes, three are Americans and there are one each of the following: Walcott, Monarch, Sidney, Carl Jameson and Porter. Two lathes are fitted with taper attachments and one with a profile attachment, another having a special milling attachment on the tool carriage.

For regular drilling and tapping there are three Barnes drill presses, each being fitted with a tapering attachment. Milling machines include a Van Norman universal and a Milwaukee vertical. The Gorton duplicator is No. 8½ D, with 12½ in. clearance for large work and fitted with a 6-in. riser block. A Deckel pantagraph machine also finds plenty of uses in this shop. The shapers include a 20-in. American and a 24-in. Gould & Eberhardt. Other tools include a 6-in. Racine cut-off saw, a speed lathe and a pattern-maker's lathe.

One of the most interesting machines in the shop is a special apparatus for shaping glassware models out of Catalin or other plastics. It was designd and built throughout by Mr. Wolff and is about as versatile as a machine tool could possibly be. As shown in Fig. 1, the blank is mounted between centers and for turning round shapes the spindle is driven through a belt from a motor mounted behind the main column. For shaping sections with almost any desired number of sides, a dividing head is fitted to the machine and can be connected to the driving spindle at will. In addition to cross and traverse motions of the lathe bed, it can also be tilted for machining tapered shapes. Mounted on the column of the machine above the lathe section is a motor-driven milling cutter, the mounting consisting of a cross-slide and a tilting arrangement. In combination with the lathe section settings this milling attachment can cut all sorts of flutes and helical grooves.

All patterns for Swindell mould castings are made in the Swindell shop, a pattern-maker being permanently attached to the staff for this purpose. Castings are supplied by two local Baltimore foundries and all are chill-cast. About 90 per cent of the moulds are made from

Fig. 7. This view shows the Milwaukee vertical milling machine and the means used for holding work during an operation on one of the flat matching faces of a bottle mould.

Fig. 8. One of the Barnes drilling machines is here being used to drill and tap holes for handles in a hand blow mould.

plain gray iron, the remainder being an alloy mixture. The alloy is usually chrome-nickel, but the actual percentage is somewhat obscure since the special ingredients are added to the ladle and not made a part of the original melt. Some stainless steel moulds are also made, perhaps a total of a couple of dozen during the past few years. In the machine shop the mould castings are stored in convenient bins, as shown in Fig. 2. This illustration also shows the operation of facing the mould halves on the Gould & Eberhardt shaper.

For very special shapes a few moulds have also been formed by the cast-to-size process. A finished hand mould set of this type is shown in Fig. 3. The halves of this mould were cast closely to size against accurately-made chills and then carefully polished. Finally the inside mould surfaces were chrome-plated. The odd-shaped bottle produced in this mould appears at the right.

The special milling attachment used on one of the lathes has already been mentioned, and Fig. 6 shows the attachment in use. The device consists of a motor-driven spindle mounted in a housing that can be tightly clamped to the tool slide, as shown. The spindle carries a chuck for holding thread milling cutters of various shapes and sizes. The attachment is used to mill threads in the neck-rings for screw-closure bottles. The milling of these threads in this manner is a much quicker and accurate operation than the conventional cutting with a lathe tool.

The Gorton duplicator is shown in operation in Fig. 9, the picture being taken from the rear to show both the work and the pattern on the work table. The vertical cutter spindle and its vertical driving motor can be seen, together with the operating handles which permit the operator to follow the contours of the master mould and duplicate them exactly in the finished work. The Gorton machine is used extensively, particularly for machine sets.

On account of the nature of the Swindell products, a considerable amount of hand cutting is necessary, both on finished moulds and on master patterns for the duplicating machines. In Fig. 10 the operator is pictured as he performs the final polishing operation on a hand press mould for making three decorative glass stoppers at one time. One of the finished stoppers lies on the bench at the bottom of the work holder. Another hand-cutting

Fig. 9. In this view of the Gorton duplicator both the work and the master mould can be seen on the work table. The machine has some special features which permit a 12½-in. tool clearance for large work.

Fig. 10. Some Swindell moulds are entirely hand-cut. Here the operator is putting the finishing touches on a hand press mould for making three glass stoppers at one time. One of the finished stoppers can be seen on the bench at the bottom of the work holder.

Fig. 11. This view shows another hand cutting operation in which the operator is producing a decorative effect on a bottle mould with hammer and chisel.

operation is shown in Fig. 11, where the operator is starting to cut a design in a bottle mould with hammer and chisel.

In the department of mould maintenance and repair, the Swindell shop is thoroughly up-to-date. One of the outstanding developments in this field during recent years has been the growing use of welding for the repair of worn spots, checks and cracks. These service defects formerly caused the scrapping of many a mould, although practically all of its expensively machined surface was still intact. The Swindell oxyacetylene welding equipment is used extensively for the repair of service defects and is shown in operation in Fig. 12. Here the operator is building up a worn neck-ring, which can then be rebored at small expense, compared to the cost of a completely new part, and returned to the plant for many more hours of productive service.

For the regular cleaning of moulds, Swindell utilizes the sandblasting operations and the Pangborn equipment in which the work is performed is shown in Fig. 13. When skillfully handled, the sandblast will remove the scale down to good metal without seriously impairing the contours of the mould surface and, of course, much more rapidly than other methods. After sandblasting the moulds are again carefully polished and the shop is equipped with five motor-driven, flexible-shaft polishers, one of which can be seen in use in the background of Fig. 13. Although most of the polishing is accomplished by these flexible-shaft machines, a considerable amount of hand polishing is also necessary, using the time-honored ingredients of elbow grease and abrasive sticks.

During the course of a year this mould shop will turn out in the neighborhood of 150 new sets of moulds, not including replacement sets, this production being sufficient to care for all the mould needs of the Swindell Brothers plant. The plant manager believes that, under their peculiar conditions of production and product, the mould department is efficient and economical, and it is thoroughly convinced that the arrangement has certain definite advantages, these being (1) that complete responsibility for mould production and quality is placed on the shoulders of one competent individual, and (2) that the mould shop can easily keep abreast of machine and other manufacturing changes without delay.

Fig. 12. Oxyacetylene welding is used extensively for repairing worn spots, checks and cracks. Here the operator is building up a worn neck-ring for reboring.

Fig. 13 Moulds are cleaned by sandblasting and then carefully repolished. At the left is the Pangborn sandblasting equipment, and one of the five flexible-shaft polishers is shown in use in the background.

G. C. A. ANNUAL MEETING

Some of the uncertainty and indecision with which the glass container industry has been operating of late was reflected at the annual meeting of the Glass Container Association, held at French Lick, Indiana, beginning October 21. The attendance was smaller than usual; many of the industry's most prominent leaders were absent—no doubt occupied with events at Toledo; several of the featured addresses failed to materialize on the program. To observers, it appeared almost as if the presidential election and golf scores seemed of greater import at the moment than the serious problems confronting the glass container industry.

E. G. Ackerman, manager of the Association, voiced something of this in his report at the opening session. He stated: "Since our meeting in May, many things have happened to interrupt the planning of this industry, and the progress we have been making over the last number of years. The rapid developments in the European War, our own defense plans, conscription, tax changes, and the civil action of the Department of Justice against members of the industry as well as against the Association, have all tended to interrupt this planning, and has made for a feeling of uncertainty and confusion. The general uncertainty has made individual companies in the industry hesitant over future policies and has also made it difficult for the Association to advance plans for new and constructive developments."

Notwithstanding the lack of new activities, manager E. G. Ackerman was able to report important accomplishments resulting from the extensive activities of the headquarters staff. The following is condensed from his detailed report.

Technical Research. The work of the Preston Laboratories, whose original objective was a standard testing procedure for use in combating fraudulent damage suits, has continued to broaden until it has become one of the Association's most important activities. In the course of analysing breakage, many facts were uncovered that added to the general knowledge of the behavior of glass and which pointed to further matters requiring solution. The damage suit problem, incidentally, appears to be aggravated and some of the cases still pending are considered as among the most serious and dangerous so far encountered. A new factor that will soon come into this picture results from the decision of the American Bottlers of Carbonated Beverages to follow the lead of the Glass Container Association in combating these damage suits. The ABCB plan includes a specific defense procedure, as well as a manual on the subject with which it will arm all of its members.

Dr. Ghering has added to the curriculum of the Preston School a course in Problems Involved in Applied Lettering. It seems that in its effort to produce brighter glazes, more resistant coloring, thicker applications through wire instead of silk screens, and through other natural technical advancements in the art, the container industry has been experiencing serious trouble. Some colors, harmless heretofore, recently have demonstrated bad effects when used on severe firing cycles. As a result of careful study, this trouble seems to be fast disappearing and suppliers are producing colors far superior to those available a year ago. Classes of instruction at Butler have been instrumental in making this new knowledge available to concerns applying color to their ware.

Legislation. This has been confined largely to work with regulatory bodies on the practical application of new legislation. An important example is the legislation prepared by the Weights and Measures Conference, last June, to standardize food containers. This will be presented to Congress at its next session, and will involve the container industry substantially.

Traffic. Highlights of an everchanging traffic situation are (1) Recent enactment of the Transportation Act of 1940; (2) Investigations into the freight rate structure of the country; (3) Recent I.C.C. orders prescribing common carrier motor rates in Middle Atlantic territory. Provisions of the 1940 act are such as to provide no good grounds for criticism of the Act itself, unless one objects to such sweeping powers being invested in the I.C.C. This latter body is authorized to make a sweeping investigation of the rate structure of all competing interstate carriers. After the investigation, the Commission has the authority to order shippers to move their merchandise by rail or truck, whichever the Commission sees fit to prescribe.

Packaging Machinery. Cooperation with the Packaging Institute has as its objective to minimize the difficulties and hence reduce the cost of packaging in glass. To this end, Mr. Kuni is preparing a manual that will be invaluable—to production managers in helping them handle their containers more efficiently, to equipment manufacturers in designing machinery for use with glass, to container manufacturers in producing ware better adapted to the service in which it will be put.

Beer Bottle Standardization. The number of styles and shapes of beer bottles will eventually be reduced from 80 to 20, as the result of a study in cooperation with brewers associations. While it may take from four to five years for this simplification program to become fully effective, it is expected that savings to both manufacturer and used will be very substantial.

Bottle finishes have increased at an alarming rate; for example, there now are 90 different standard bottle finishes, 21 milk bottle finishes. Most of these finishes are made in from one to 26 sizes, and it is estimated that in the neighborhood of 1,000 different finish rings are required to take care of the general line only. Standardization of milk bottle finishes has already been attempted, and a single finish developed, but the work must be extended to all lines of ware.

The most important single activity of the Association, in Mr. Ackerman's opinion, is the *Research and Trade Promotion* program initiated in 1939 under the direction of Mr. W. Scott Faron. During the first half of the year, events in the domestic and international field checked the full development of the Association's "long range" plan of industry promotion; but last May activities were resumed on a slightly reduced scale.

In general, 1940 promotion has been characterized by increased use of merchandising, continued publicity and research, and a decrease in consumer advertising. Spe-

cific projects that have been noteworthy include: A second major promotion on behalf of No-Deposit Beer Bottles; launching an offensive attack on milk containers; the Red & White Glass-Packed Foods Sale, one of the largest cooperative campaigns in the food trade.

Beer. A merchandising display contest on No-Deposit Bottled Beer was inaugurated in Massachusetts, Rhode Island and Connecticut. 1741 dealers or 46.4 per cent of all retail outlets in these states entered the contest, in itself a remarable achievement. Results: Shipments of no deposit 12-ounce bottles increased 41.75 per cent from March to August. If one includes the quart sizes, introduced last March, total shipments for the first eight months of 1940 were 259,501 gross, as compared with 231,289 gross a year ago.

Progress in territories outside of the contest area have not been so good, a situation which Mr. Faron attributes to a lack of sponsored censored consumer advertising; whereas other packaged beer has been backed by national advertising on a large scale.

Milk. In 1939, the two-quart paper container was announced by the milk trade with a great deal of fanfare in New York City. After less than a year, the two largest New York distributors have adopted the new-style 17¾ ounce bottle, which suggests that all is not well with the paper container. This conclusion is supported by rumors of unexpected expense encountered with that type of container. The Association has prepared promotional material for glass milk bottles, which it first introduced to the dairy trade at its 1940 convention in Atlantic City.

Food. Patterned after the successful I.G.A. drive of 1939, a cooperative merchandising campaign was initiated by the Red and White stores beginning in October. The goal is two million cases in an eight week drive. The Red and White Corporation is one of the oldest and most respected of the voluntary chains, and this is the first instance it has ever worked with an outside group. Herbert T. Webb, advertising director of Modern Marketing Service (the food brokerage organization affiliated with Red and White), addressed the French Lick meeting and explained the details of this sales effort.

Standardization. One of the most interesting and practical talks at this meeting was given by Mr. C. P. Overmyer of the Standards Committee. Mr. Overmyer demonstrated a need for greater standardized practice in making neck rings. As the average bottle cap will not fit maximum or minimum glass dimensions, it is necessary to make the glass at mean dimensions, and hence to make the rings of a size to produce the mean dimension. Here the variation between large and small diameters as to the amount of shrinkage, becomes a factor. The investigation made in 1932 by the committee showed that on sizes up to 33 shrinkage fell almost entirely between the .007-.009 bracket, while on sizes 38 to 89 it was between .010 and .017.

Another result of this variation in shrinkage between large and small sizes, has been to break down the tolerances into smaller groups instead of allowing the same tolerances to run through all sizes.

In connection with Crown finishes, while investigation has revealed little variation in locking rings, many different contours have been found in the re-enforcing ring. The net result is a lack of exactitude in Crown finish standards, and many form tools show slight variation. Also, the standard .697 height of the Crown finish rings actually varies between .687 and .750.

The Standards Committee feels that if ring standards were more exactly defined and maintained, it would not be necessary to keep so many different shapes in stock and they could be turned out by the thousands by any mold shop, at a fraction of their present cost. The savings to the industry would be tremendous.

Statistical. As reported by Mr. Victor Hall, the productive capacity of the industry has risen from approximately 57 million gross in 1929 to over 83 million at present, an increase of 46 per cent. This increase is due primarily to perfection of lictingue, although the lightweight containers have influenced the trend materially since the inception of the program in 1937.

Shipments for the 9 months of 1940 show an increase of 18.47 per cent over 1936, but are one per cent short of 1937. Shipments for the full current year are estimated at 52,250,000 gross. October and November are not expected to equal those of 1939, which were unusually high months last year, but a better December is anticipated, making it possible that a new all time high will be set in 1940.

Food container shipments are 13 per cent ahead of 1936, a figure that lags behind the trend of the entire industry. Poor crops are considered responsible, particularly in the catsup field. Pressure and non-pressure ware have had a banner year in 1940, showing an improvement of 31 per cent over 1939. A number of new beverages appearing on the market have helped to attain this total. Beer bottles are 26 per cent ahead of last year, in which the new no-deposit bottle was a factor. Liquor ware has followed increased purchasing power to show a gain of 25 per cent over 1936. Toilet ware is 11 per cent ahead of 1936 and 2.8 per cent above 1939. General purpose containers are up 34 per cent and milk 4 per cent below 1936. Paper containers have proven a competitive factor here, and also the increased use of the two quart size has cut down the number of units.

At the annual dinner of the Association Tuesday evening, tribute was paid to James Morrison, sales manager of the Obear-Nester Glass Co. Mr. Morrison is completing 65 years of uninterrupted service in the glass container industry, having started in 1877 at the age of 10 with William McCullough of Pittsburgh. Mr. Royden A. Blunt, toastmaster, gave a brief outline of Mr. Morrison's career as a glass man and then presented him on behalf of the Association with a beautiful tea service. Dr. Frank Preston then discussed some phases of the war, and made some penetrating observations on the situation as concerns the British.

AWARDED PITTSBURGH PLATE CONTRACT

The H. K. Ferguson Company, Cleveland, has been awarded a contract by Pittsburgh Plate Glass Company, for an addition 100 ft. x 100 ft. to the warehouse building at Clarksburg, W. Va. The structure will be steel frame, asphalt protected metal sides and roof, and steel sash, to match existing building. Also included in the work of remodeling an existing building, extension of railroad siding and yard roadways, and changes to cullet crushing and other operating equipment. Work will begin at once.

MONOPOLY SUIT SETTLEMENT APPEARS IMMINENT

The problem of reorganizing a major enterprise in the glass container industry to the satisfaction of the United States Department of Justice was being tackled from around a conference table in Toledo, Ohio, instead of before the bar of Federal Court, as this issue of THE GLASS INDUSTRY was being prepared for publication.

Just when the trial was all set to begin on October 18, a new proposal was submitted providing for the establishment of an "institute" instead of dissolving the Hartford-Empire Company.

Submission of the new proposal, which was prepared by counsel for the Anchor-Hocking Glass Corporation, the largest of the firms generally described during the litigation to date as "smaller licensees," struck the courtroom like a bombshell. The two score or more attorneys and others who gathered for the opening statements in the trial were further surprised to hear counsel for the Government, Samuel S. Isseks, say that the plan might be acceptable to the Department of Justice.

When Stuart Wall, counsel for Hartford-Empire, told the court that his client would be pleased to study the proposal and report within three days as to whether it could be agreed to in principle, a continuance to October 21 was readily granted. On that date, Mr. Wall announced that Hartford-Empire was agreed in principle to the proposed "institute" plan and a still further continuance was granted. It was expected that by Oct. 29 (the next scheduled session in court) it would be known definitely whether complete settlement of the case is possible; but this proved sheer optimism. When the 29th of October rolled around, Hartford and the Government had reached an agreement in principle only. Another continuance was granted until November 1st, by which time it is now hoped that a meeting of the minds finally can be reached as to the specific terms.

That the defendant corporations have gone the full limit in their attempt to settle the case was indicated by some of the motions filed by their attorneys at the pretrial conference on October 15. At that time, Judge Kloeb had replied in answer to a suggestion that he order a settlement, that he certainly "would investigate whether he had any such authority under the code." Apparently taking their cue from this remark, attorneys for four of the defendants promptly drew up consent decrees to which they were willing to subscribe and moved that they be dismissed from the case. The Government in that case would have had no say in the matter. It is reported that this is the first time in the history of the new code of the Federal Court practice that motions of that type had been offered.

Judge Kloeb ruled, after a three-day recess during which he examined the law, that since the charge was conspiracy it would be "robbing a tree of its limbs" to dismiss some of the defendants. Government attorneys elated at the Court's decision, have asked that the opinion be published in legal journals.

Throughout this period of intensive negotiation, a cordial and cooperative spirit has been maintained between the litigants, and attorneys for the Government have remained on call and several times have been invited to participate in many of the defendant's sessions. None the less, it is clear that should the conferences break down, the case would immediately go to trial.

However, as this report is written, attorneys for both sides are freely expressing their confidence that the matter more than likely will come to an early settlement.

Only three hurdles of a major character remain: First is the price to be paid, and here it is understood that the actual book value of Hartford's assets do not reflect a true picture of their real worth. Secondly is the Hazel-Atlas-Hartford contract. And finally, the contractual relationships between Hartford and its licensees and between the licensees themselves are too numerous and intimate to be dismissed easily. In this latter connection, however, it is reported that Hartford already has notified its licensees in a general letter that they will no longer be held to the restrictive provisions (types and quantities forms) in their contracts.

If and when these three major problems can be overcome, the path is open to a Consent Decree. Such a decree, it is estimated, would take from six to eight weeks to prepare, and would take the form of a series of injunctions. The Toledo Court and Judge Kloeb would have complete jurisdiction over the administration of the decrees and over the operation of the glass container industry.

U. S. NOW MAKING COVER GLASSES

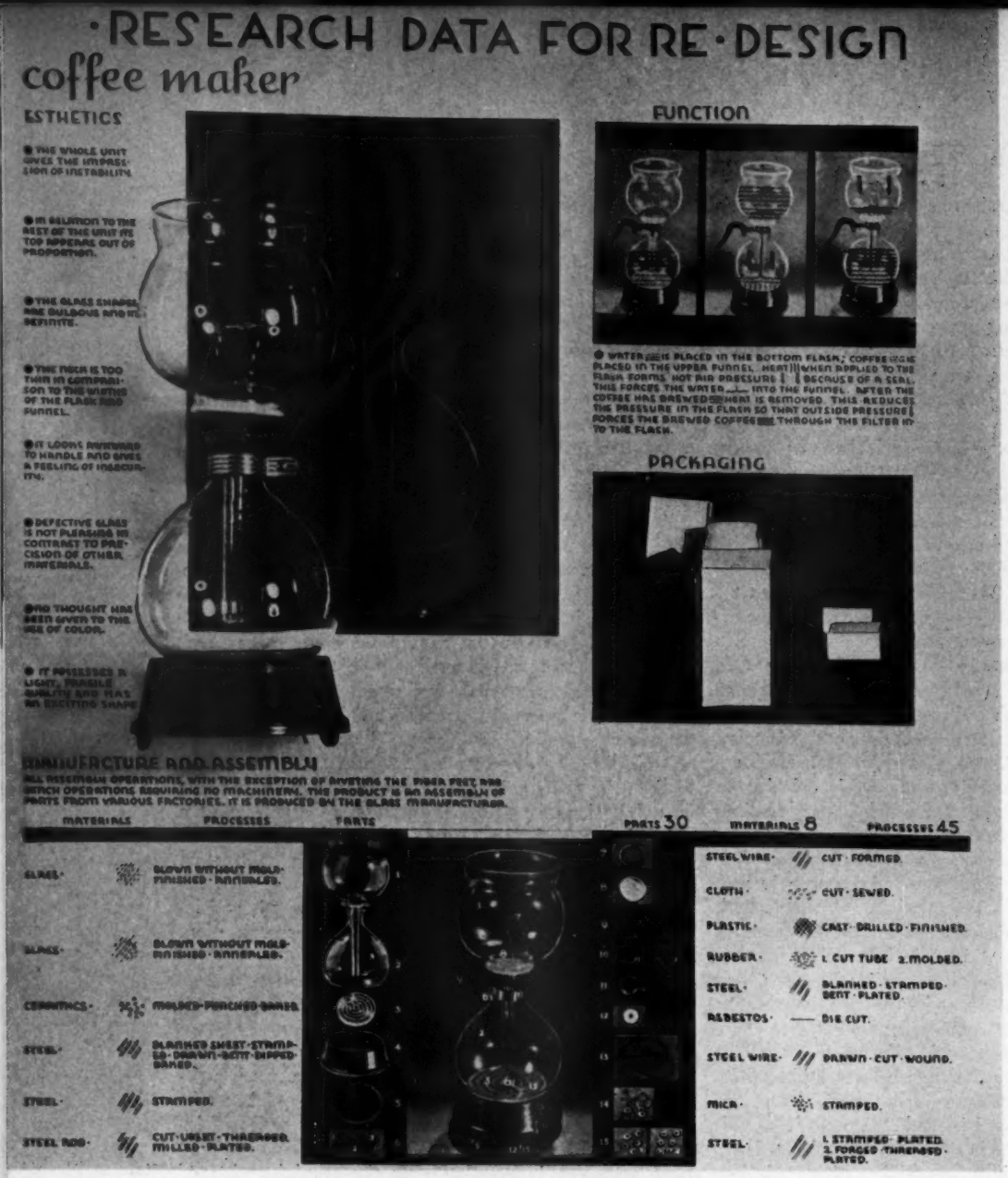
That one of the most serious bottlenecks in the defense program has finally been eliminated, may be seen from the announcement of the American Window Glass Co. that it is now producing cover glasses commercially. As stated in the September issue of THE GLASS INDUSTRY, cover glasses for use with microscope slides have hitherto been obtainable from Europe.

The new glass, to be known commercially as Lustra Cover Glass, is extremely thin and practically colorless with an average thickness of 7/1000 of an inch. It is claimed that this new glass is equal in every respect to the German product which was produced under a closely guarded secret.

With the necessity for conducting physical examinations of men chosen for military service under the Selective Training and Service Act, it is estimated that the medical need for this fragile and precious glass will be increased more than 33 per cent.

It is said that there are only a few cutters in this country trained to cut this glass. Most of the Lustra Cover Glass will be transported to a cutting establishment near Philadelphia by either air express or a specially built shock-proof truck.

• The Fall meeting of the Industrial Minerals Division, A. I. M. M. E., held in cooperation of the Institute of Ceramic Engineers and in joint session with the Illinois Mineral Industries Conference, will be held November 14-16 at Urbana, Ill. Following the technical sessions, two inspection trips are scheduled; one to Danville, visiting the Western Brick Co., the other to Ottawa, inspecting the silica sand pit and plant of the Ottawa Silica Co., and the plant of Libbey-Owens-Ford Glass Co.


·RESEARCH DATA FOR RE·DESIGN
coffee maker
ESTHETICS
FUNCTION
PACKAGING
MANUFACTURE AND ASSEMBLY
MATERIALS
PROCESSES
PARTS
PARTS 30
MATERIALS 8
PROCESSES 45
GLASS · BLOWN WITHOUT MOLD · FINISHED · ANNEALED.
GLASS · BLOWN WITHOUT MOLD · FINISHED · ANNEALED.
CERAMICS · MOLDED · PURCHASED · BAKED.
STEEL · BLANKED SHEET · STAMPED · DRAWN · BENT · NICKEL PLATED.
STEEL · STAMPED.
STEEL ROD · CUT · INLET · THREADED · MILLED · PLATED.
STEEL WIRE · CUT · FORMED.
CLOTH · CUT · SEWED.
PLASTIC · CAST · DRILLED · FINISHED.
RUBBER · 1. CUT TUBE 2. MOLDED.
STEEL · BLANKED · STAMPED · BENT · PLATED.
ASBESTOS · — DIE CUT.
STEEL WIRE · DRAWN · CUT · WOUND.
MICA · STAMPED.
STEEL · 1. STAMPED · PLATED. 2. FORGED · THREADED · PLATED.

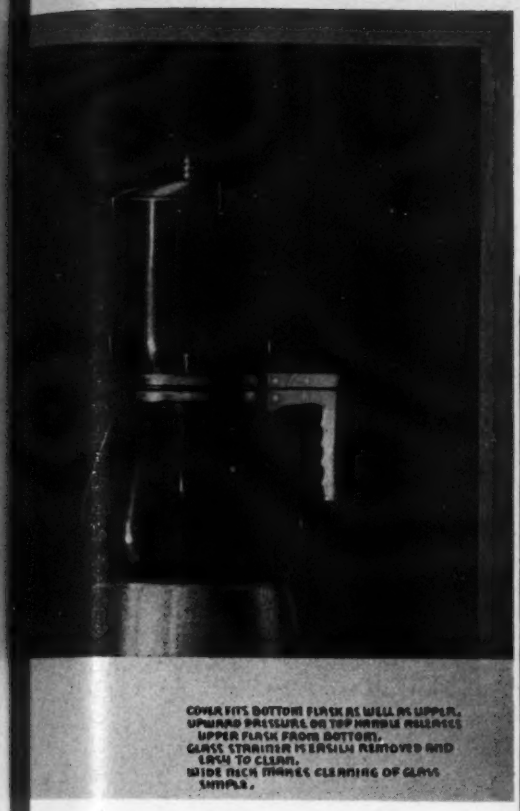
1. "Breakdown" of a coffee maker. Here the student has analyzed the existing design from the manufacturing, sales and consumer angles. The sketch on the top of the next page shows how the student has redesigned this object so as to meet all objectives he has noted.

GLASS DESIGN AT CARNEGIE TECH

The importance of the role which Design was destined to fill in the industrial field was foreseen five years ago by Pittsburgh's Carnegie Institute of Technology, when with remarkable initiative and foresight it instituted the first degree-course in Industrial Design ever to be offered in America. The first graduates from this four-year course received their diplomas in 1937. The rapid absorption of these men and women by industry and their continual success in their respective fields, including glass, is significant of the soundness of the Carnegie project and its curriculum, and of the needs of industry.

In the course on Industrial Design, the students work with all of the important contemporary materials; as glass, metal and wood. During the first two years their time is devoted to drawing, painting and design from a visual and structural viewpoint. During the two final years, studies are directed toward practical problems in specialized industrial fields. The result is the achievement of a realistic attitude. And this practical attitude, so essential in glass making and so rarely achieved in this field, has brought the Carnegie Tech graduate recognition and employment by a number of our larger glass companies.

When confronted with problems involving glass, the


COVER FITS BOTTOM FLASK AS WELL AS UPPER.
UPWARD PRESSURE ON TOP HANDLE RELEASES
UPPER FLASK FROM BOTTOM.
GLASS STRAINER IS EASILY REMOVED AND
EASY TO CLEAN.
WIDE NECK PERMITS CLEANING OF GLASS
SURFACES.

2. (Above) Redesigned coffee maker. Note contrast with the old design on the previous page.

3. Typical of the work produced by the students at Carnegie Tech. These designs compare favorably with much of the glassware produced by old hands at the business.

designer approaches them with the knowledge gained from numerous field trips into the glass plants of the Pittsburgh area. He investigates all new developments in the glass industry. And he solves glass design problems in the tableware, container, illuminating ware and structural glass fields through his familiarity with a fundamental design principle known as "breakdown."

The conditioning factors involved in "breakdown" are the manufacturer's angle, material and process, the sales angle, appearance and merchandising, and the consumer's angle, utility. As seen in Figure 1 a coffee brewer has been broken down into the three points of view mentioned. Criticisms have been made as to appearance; materials have been listed for structural and visual qualities; the process of manufacture of each material has been briefly noted; the function of the product has been defined; and consumer criticism has been considered in this "breakdown." Only after a thorough study of accumulated research data is the designer equipped to re-design the coffee brewer. He has worked with the idea of improving the appearance, symmetry and utility of the product, and Figure 2 shows his solution of this re-design. The coffee brewer "breakdown" was made by two members of the Industrial Design Department within

4. Designs that are definitely "styled" need not be impractical when produced with an understanding of the manufacturing problem.

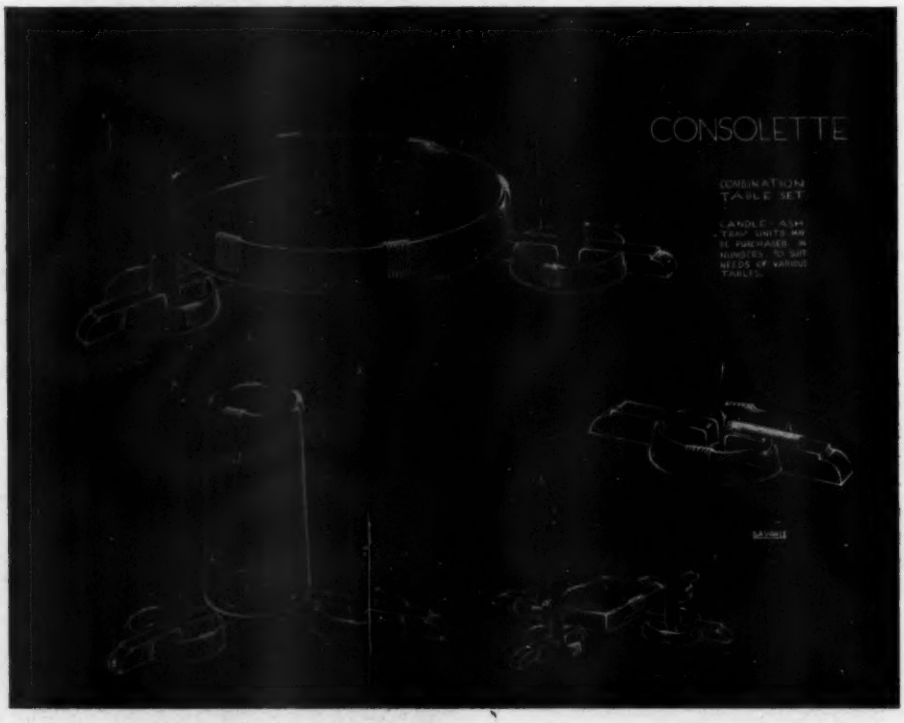
5. (Above) Tumbler, whiskey glass, celery dish and cigarette box, all designed in the same motif.

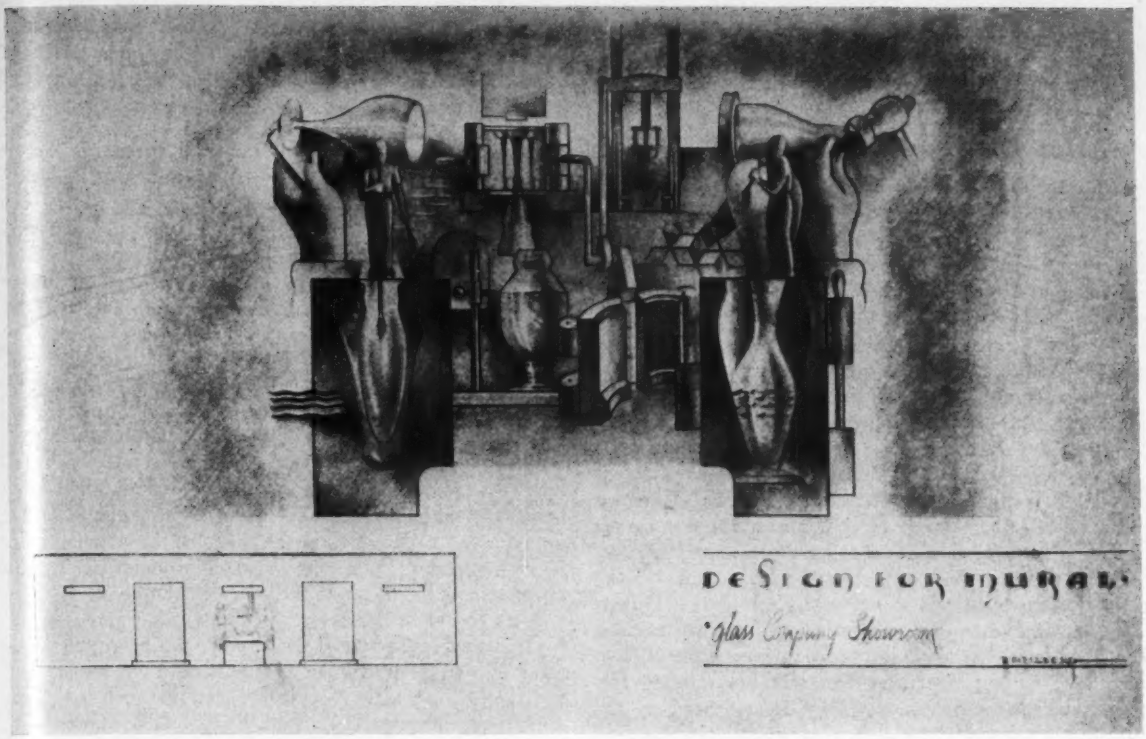
the past year. Their findings were given to the rest of the class who were asked to submit a re-design in two weeks based on this "breakdown." Such a time limit on design problems is standard procedure since problems given the graduate in the glass field would undoubtedly be deadlined.

Beside the "breakdown" of products already on the market and their subsequent re-design, the glass designer at Carnegie has done outstanding work in new design of stemware and containers. Figure 3 is typical of the new shapes and cuttings that have come from the rooms of the Industrial Design Department. Graceful and practical the goblets, champagnes, cocktails, and cordials pictured in this illustration are the result of careful planning and study of appearance and usefulness. The distinctive tumbler in Figure 4 is egg-shaped, and the high cut base enhances its beauty. The perfume containers also pictured in Figure 4 are additional proof of the quality of design practiced at this Pittsburgh school. A tumbler, whiskey, celery dish and cigarette box with nested ash trays all designed in the same motif are shown in Figure 5. Attractive and unusual is the design of the combination table set "Consolette" in Figure 6. All the designs shown here are evidence enough that originality and a knowledge of design fundamentals are predominant in the work of the Carnegie designer.

An important part of the student's training in Industrial Design which should be mentioned further is the study of the actual processes of glass manufacture. It is the faculty's belief that the student to be well prepared for his job in glass design must study his material from every angle. To acquaint the designer with glass pro-

6. (Below) A consolette that shows the originality and sales mindedness of the designer.





7. Mural decoration, emphasizing the production motif, such as would be ideal for the general offices of the production department of a glass company.

8. Another "production mural," in which the idea is conveyed with a maximum of simplicity and directness. These qualities are the hallmark of expertness in design.

cessing, trips through glass plants are arranged throughout the year. Competent guides conduct the students through different departments of the glass factory, stopping in the furnace room, mould shop, batch mixing and annealing rooms and decorating and shipping departments so that explanations of glass manufacture may be made. After several such visits the students begin to understand what makes up the glass batch and how glass is melted, formed, annealed and decorated.

The illustrations as seen in Figures 7 and 8 are designs for mural decorations and present in simplified form the procedures of glass manufacture. Designed to decorate the walls of glass company showrooms, these so-called "production murals" have a double purpose in relation to the student's training. First, the obvious appropriateness of the forms found in the plant leads the student to extensive research in process. And, second, the showroom problem obliges him to consider the relation of the decoration to the merchandise in the showroom to insure that the decoration remains background for the ware rather than dominate it. When the student, with further practice and observation, is more familiar with glass manufacture he is not likely to waste time designing an object which is either too complex and expensive to manufacture or which is impractical from a utility standpoint.

The story of the industrial designer at Carnegie Tech has really just begun. The next few years should see startling developments in glass design, and the graduates of this progressive school will be well in the foreground of the new specialized branch of the glass industry.

INVENTIONS AND INVENTORS

Summary of United States Patents of Interest to the Glass Industry Issued During September

Corning's Vycor Patents

Since the Corning Glass Works announcement last year of "shrunk glass" which was "pulled together" after leaching out an immiscible portion of the body, the hats of the entire scientific world have been off to the inventors, Harrison P. Hood and Martin E. Nordberg. Of great scientific interest is the fact that this is believed to be the first industrial application of the knowledge that some silicate glasses may at certain temperatures unmix to form two distinct glasses, spaced around each other. The products of the new Corning process sold as 96 per cent Silica or Vycor products were covered by patent 2,106,744 which issued Feb. 1, 1938, but the process patent 2,215,039, did not issue until Sept. 17, 1940. The two patents were filed March 19, 1934, as a single application which was later split in order to separate the process and product claims. Consequently, except for the claims, the two patents differ only slightly in wording.

Hood and Nordberg discovered that glass compositions in a certain region of the ternary system—R_2O—B_2O_3—SiO_2 will, on the proper heat treatment, separate into two phases, which separation generally is evidenced by the appearance of a slight bluish opalescence in the glass; that one of these phases is very rich in silica, and the other phase is very rich in alkali and boric oxide; that the latter or soluble phase is soluble in acids and may be leached out of and away from the silica-rich phase, leaving the latter in a rigid cellular structure which maintains the original shape of the initial glass and which is permeable to water; that further leaching or washing in pure water further purifies the remaining high silica glass; that the article thus obtained, consisting of the highly silicious insoluble phase, can be heated slowly to dehydrate it and can subsequently be revitrified by heating to 900 deg. C. or above to yield a transparent homogeneous article having a composition of approximately 5 per cent B_2O_3, 0.5 per cent R_2O, and the balance silica.

The patents gives ternary diagrams for Na_2O—B_2O_3—SiO_2, shown in Fig. 1, K_2O—B_2O_3—SiO_2 and Li_2O—B_2O_3—SiO_2, indicating compositions suitable for the process. In the diagram for the first system the compositions within the loop X are reported to separate so easily into two phases as to require no heat treatment except that received in normal manufacture. The area between loops X and Y represents compositions which require additional heating at about 600 deg. C. to bring about the separation.

In practicing the invention, they may, for example, select a glass having the composition of 75 per cent SiO_2, 5 per cent Na_2O, and 20 per cent B_2O_3. The selected glass is melted in the usual manner and is then fabricated in the usual way into the desired articles, such as beakers, flasks, tubes, dishes, sheets, and the like.

The glass is then subjected to a heat treatment which, to some extent, will depend upon the composition chosen but which, for the above composition, preferably comprises heating the glass for three days at a temperature of 525 deg. C. Practically the same result may be accomplished by heating at a higher temperature for a shorter time, say 600 deg. C. for a few hours, or by heating at a still lower temperature for a longer period of time. The choice of heat treatment will also depend upon the rate at which the original article cooled during fabrication and, with wall thicknesses of 4 to 6 mm., best results with least subsequent breakage are obtained with a heat treatment at 600 deg. C. to 650 deg. C. for two hours or less, whereas in the case of thin ware, these results are obtained at about 525 deg. C. for a few days. The heat treatment, if properly carried out, will cause the glass to become more or less completely separated into two distinct phases, one of which is very rich in boric oxide and alkali and is soluble in acids, the other being very rich in silica and insoluble in acids, as mentioned above. The glass at this stage of the process may be characterized by a more or less pronounced bluish opalescence, due to the separation of the phases.

After the glass has been heat treated and annealed, it is immersed in an acid bath comprising, preferably, three normal hydrochloric acid or a solution having an equivalent hydrogen ion concentration, such as five normal sulphuric acid, the bath being held preferably at a temperature of approximately 98 deg. C. They have also carried out the acid treatment at room temperature and at temperatures and pressures obtainable in an autoclave. The glass is kept immersed in the acid bath for a length of time which depends on the temperature of the bath and the thickness of glass to be leached. They found that at a temperature of 98 deg. C. this length of time will approximate one day for each millimeter of glass, that is, an article which is 2 mm. thick will require about two days immersion for complete penetration of the acid, but a longer immersion will do no harm. The acid treatment, if properly carried out, will cause complete solution of the soluble phase. At the conclusion of this step in the process the articles are more sensitive to

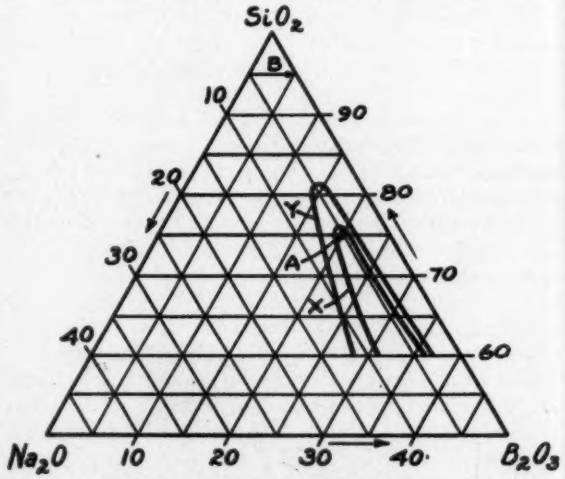


Fig. 1. 2,215,039: Hood and Nordberg. In the process of forming 96 per cent silica glass by first leaching one glass phase from performed borosilicate glassware and then revitrifying and shrinking the remainder, suitable compositions lie within the X and Y loops.

thermal shock than before and care must be taken to avoid sudden temperature changes.

After the acid treatment, the glass is washed to remove all traces of the soluble phase and also any soluble impurities, such as iron, which have been acted on by the acid. Washing may be accomplished by immersing the glass for ten or twelve hours in pure running water in such a manner as to expose all leached sides of the glass to the action of the water. It is believed that the removal of the soluble phase leaves the silica phase as a rigid and porous gel-like structure. This structure retains the original shape of the article and may be handled without breaking but readily takes up grease and other foreign materials, which may leave a mark on the finished article. It is best to avoid handling the article with the bare hands at any time during the process.

After the article has thus been leached and washed, it is subjected to a vitrifying heat treatment in order to dehydrate it and to convert the cellular structure to a nonporous vitreous condition. During dehydration the article becomes white or opalescent but develops transparency as the temperature is raised to the neighborhood of 900 deg. C. When complete transparency is attained, vitrification is complete. Heat should be applied with sufficient slowness for the first few hundred degrees, so that the article may not be shattered by a too sudden evolution of water. The temperature is carried to a maximum of 900-1000 deg. C., at which point it is held for a short time. Higher temperatures may be used, provided the article is supported on a form to prevent distortion in shape. The vitrified article may then be cooled rapidly, even to the extent of quenching it in cold water, because it is now composed of almost pure vitreous silica and contains only about 5 per cent B_2O_3 and about 0.5 per cent Na_2O. An ultimate volume shrinkage occurs, which, in the case of a glass of the above composition, is found to amount to about 20 per cent.

In carrying out the invention, the viscosities involved at temperatures below 750 deg. C. are such that the separation does not take place quickly in the usual form of an emulsion or system of droplets dispersed in a second phase, but separates into a continuous thread-like structure of the soluble phase embedded in the insoluble phase. The soluble phase, being of a continuous nature, can be entirely removed from the insoluble phase. When this is done, a rigid porous structure of the original glass shape is left after the soluble phase is leached out. After washing and drying, this porous structure can be heated until the viscosity of the silica rich glass decreases to such a point that surface tension forces surrounding the pores are sufficient to cause a collapsing of the porous channels, driving out what gases may be contained within them, thus resulting in a completely transparent solid glass of zero porosity. During this operation the original shape of the glass article is retained, though a shrinkage in dimensions occurs corresponding to a volume loss which is equivalent to that of the removed phase, namely, about 20 per cent with the glass of the above composition. This final glass possesses all the properties of the glass which would result from the usual processes of melting and working a glass of the same composition, if such a thing were possible.

The separation of phases discovered by Hood and Nordberg appears only below a liquidous of about 750 deg. C. and can be made to disappear or revert to miscibility above its liquidous of about 750 deg. C., but below 1000 deg. C. Between 750 deg. C. and 1000 deg. C. only devitrification can take place, whereas below 750 deg. C. both devitrification and the separation into two immiscible phases can take place. Due to the high viscosities which are involved, devitrification below 750 deg. C. is decidedly slower than the separation which is due to the immiscibility of two glasses.

Other Composition Patents

Another patent granted last month to Harrison P. Hood (2,215,040) is concerned with compositions which yield a strong white fluorescence when irradiated with ultra-violet radiations. A demand for such glasses has been created by the increasing use of luminous discharge tubes for signs and advertising displays. The Hood compositions contain from 0.5 to 7.0 per cent thallous oxide, and must be free of "second group sulfides."

Fred Cornetto of Washington, Pa., claims in patent 2,215,209 (assigned one-fourth to Maurice M. Sullivan of Pittsburgh) that a glass which is resistant to frost formation can be made by mixing the glass-forming batch with alcohol and water, drying it, and then melting and forming the glass in the normal way. It is reported that when sheets formed in this manner were placed in a mechanical refrigerator they did not become frosted until half an hour after similar sheets made from the same batch which had not been pre-treated with alcohol and water.

Furnaces

Patent 2,215,982 represents a new type of electric melting furnace added to the developments in that field by Games Slayter and his associates. The co-inventors were Flavius W. Atkinson and Ed Fletcher, both of Newark, and the patent was assigned to Owens-Illinois Glass Company. As shown in Fig. 2, there is an upper electrode 20 within the furnace, a lower electrode 16 lining the furnace floor, and an opening 18 through this electrode for drawing. An essential part of the invention is also means for independently heating the lining of the outlet.

Feeding, Forming and Shaping

The manufacture of cellular or bubble glass for heat and sound insulation has received much attention at the Creighton Works of Pittsburgh Plate Glass Co. The latest modification of the bubbling process, covered by Wm. O. Lytle's patent 2,215,223, provides a tall column of molten glass, as shown in Fig 3,

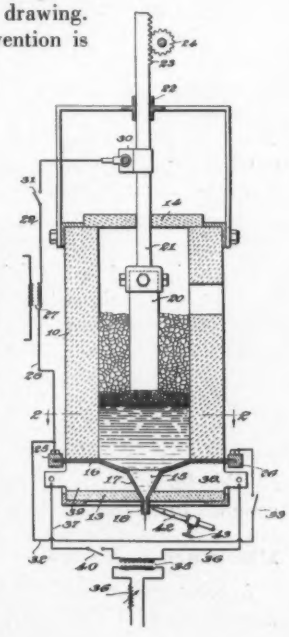
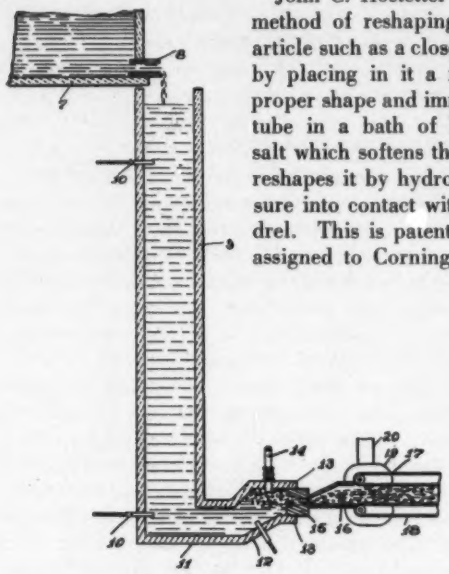


Fig. 2. 2,215,982: Slayter, Atkinson and Fletcher. Electric melting furnace.

with gas bubbled in at the bottom just before the glass passes through a restricted throat. Its emergence into a zone of lower pressure allows the foamed structure to develop.



John C. Hostetter patented a method of reshaping a formed article such as a closed end tube by placing in it a mandrel of proper shape and immersing the tube in a bath of hot molten salt which softens the glass and reshapes it by hydrostatic pressure into contact with the mandrel. This is patent 2,215,041, assigned to Corning.

Fig. 3. 2,215,223: Lytle. Gas is bubbled into molten glass which flows through a restriction and then expands to form cellular glass.

Patent 2,215,984 granted to Leonard D. Soubier (Owens-Illinois Glass Co.) shows how a standard Owens suction gathering machine has been modified to make hollow ware such as inner threaded insulators. The apparatus is so built that after the blank is formed it is enclosed by a press mold and a threaded mandrel is pressed against the blank to shape it against the walls of the press mold.

John T. Wood of Bootle, Liverpool, England, patented a weighing apparatus for controlling the feeding of glass charges (2,215,417). The apparatus periodically weighs a formed article but does not alter the rate of feed until there has been a summation of a number of weighings.

Decoration

To provide a more sharply defined band when applying color stripes to tumblers and other ware, Harold R. Schutz, Toledo, O. (2,215,981, Libbey Glass Co.), uses a banding disk with two sharp outer edges and a concave surface, as illustrated in Fig. 4.

Arthur D. Nash of Sewickley, Pa., obtained a patent on a process of applying a fused decorative coating to glass tiles. The method is to bed a glass plate in a layer consisting of finely crushed glass and a more refractory material such as sand, and heating the assemblage enough to cause the glass particles to adhere. This gives a rough surface having decorative value and one which is suitable for mortar adherence. This is patent 2,215,227 assigned to Pittsburgh Plate Glass Co.

Miscellaneous Processes

Apparatus for nodulizing or briquetting glass batch was patented by George W. Batchell, Wilbur S. Mayers and Franz G. Schwalbe, of Toledo (2,214,191 to the Frangeo Co.).

Three patents were granted to Westinghouse Electric & Mfg. Co. inventors for means for making seals in electric bulbs. These were 2,215,100 to Daniel S. Gustin, Bloomfield, N. J., 2,215,641 to George A. Freeman, East Orange, N. J., and 2,215,644 to Robert F. Hays Jr., Bloomfield, N. J.

Patent 2,215,980 granted to Carl W. Schreiber of Libbey Glass Co., Toledo, discloses a method of burning off hollow glassware by applying a flame to a localized circumferential region to soften the glass in this region so it can be simultaneously elongated a given amount, and then chilled by an air blast and finally burned off by the application of a cutting flame to the chilled glass.

Lens grinding machines were invented by John D. Gamble, Forest Hills, N. Y. (2,213,958), Kenneth C. Burroughs, Rochester, (2,214,361 to Bausch & Lomb Optical Co.), and by Douglas Taylor, of Ladywood, Birmingham, England (2,214,977).

George W. Newton of Baltimore received patents 2,216,088-090 for mixing apparatus and assigned them to Crown Cork & Seal Co.

Plate and Sheet Glass

Frederic L. Bishop and Charles S. Shoemaker assigned to American Window Glass Co., their patent 2,214,153 for a method of making laminated glass. To avoid the pressure effects derived from the use of a preformed sheet of plastic bond in the usual pressing and heating operation, they use a modification of the liquid bonding process. In accordance with the invention a film of bond formed on two glass sheets is heated to drive off a portion of the solvent. The layers are then flooded with a so-called contacting agent and the two sheets are immediately placed together. They are passed between a pair of rolls or a wringer to squeeze out any excess contacting agent. The process is then completed by immersing the sandwiches in water at 180 deg. F. for about an hour.

An improved lehr drive for sheet glass machines, as

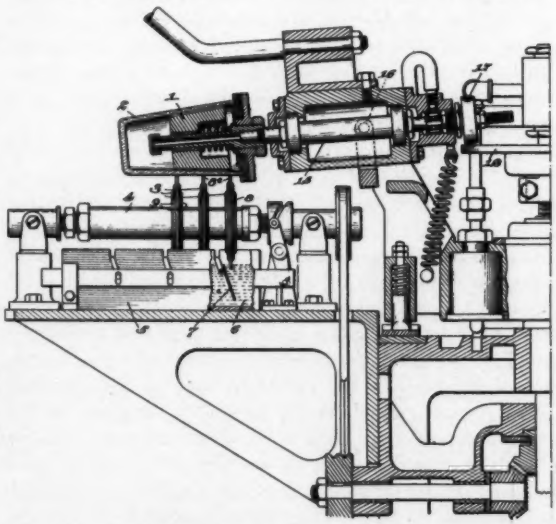


Fig. 4. 2,215,981: Schutz. In banding tumblers, the color-bearing disks 8a have concave circumference which give the color bands a sharper edge.

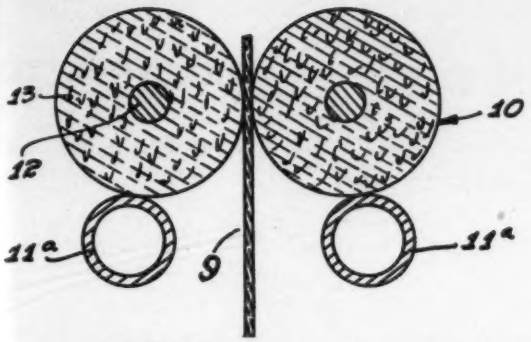


Fig. 5. 2,215,231: Redshaw. In the Fourcault machine the drawing rolls 10 rest on drivers 11a and bear by gravity against the sheet.

used in the Fourcault and Slingluff processes, was invented by Joseph H. Redshaw of Homestead Park, Pa. (2,215,231 to Pittsburgh Plate Glass Co.). The invention replaces the normal sheet drawing means wherein the rolls on one side are fixed and those on the other side of the sheet are pressed inward by weighted levers. As shown diagramatically in Fig. 5, the drawing rolls (10) rest on driving rolls (11a) and are borne by gravity against the sheet. The hollow driving rolls may be air cooled.

Another Pittsburgh Plate Glass Co. patent was James G. Oliver's 2,215,228 for a process and apparatus for bending sheets.

The late Arthur McK. Greaves-Walker was co-inventor with Ormond H. Paddock of Libbey-Owens-Ford Glass Co. of a mold composition for bending sheet glass, and Mr. Paddock also patented an apparatus for tempering such glass. The composition claimed as a highly satisfactory mold bed material in patent 2,213,406 consisted of a powdered mixture of common red brick and tuile (scrap from doors of pot furnaces). Mr. Paddock's tempering method for bent glass sheets (2,213,405) is concerned with the well known process for suddenly chilling heated sheets to place their outer surfaces under compression and the interior under tension. The invention, as illustratd in Fig. 6, provides blowers on both sides of the sheet in curved relationship, with oscillation means for distributing the blast.

Another Libbey-Owens-Ford patent is 2,213,422 which is a polarized light inspection apparatus for sheets, invented by Emmett L. Walters of Toledo.

Glass Blocks

Rob R. McGregor and Earl L. Warrick of Mellon Institute assigned to Corning Glass Works their patent 2,215,048 for an improved structure using glass blocks. The surfaces to be bonded with mortar are coated with a two-layer lacquer made from synthetic resins. A layer of hydrolyzed silicate ester is applied to the glass and an overlaying layer of vinyl acetate polymer is then applied. The latter layer when used without the ground coat does not adhere permanently to the glass in the presence of moisture.

Patent 2,215,027 assigned to Corning Glass Works is another in the Henry H. Blau group for uniting the halves of glass blocks during manufacture. In this instance the method provides a dwell period after the two heated halves are brought into position for joining, to allow the escape of some of the air through vent openings before the seal is consummated.

Glass Wool and Fiber

The normal complement of Owens-Corning Fiberglas Corporation's usage patents is comprised this month of 2,214,294 to Chas. L. Day, of Corning, N. Y., for an insulating covering for water tanks etc., consisting of glass wool encased in linoleum, and 2,214,750 to Frank L. Myers of Toledo for an air filter construction.

Clemens Hannen of Sinzig-on-the-Rhine, Germany, received patent 2,215,150 for a process of coating fibers, which are still plastic from forming, with a dust of glass, sand, asbestos, quick lime, limestone, fluorspar, chalk or pumice to render the fibers more suitable for spinning and weaving.

New Products and Uses

Multiple glass sheet glazing units and methods of making them were described in patents 2,213,468 and 2,213,395 assigned to Libbey-Owens-Ford Glass Co. by Chas. D. Haven and John J. Hopfield, respectively.

Another patent in the numerous group granted this month to Libbey-Owens-Ford Glass Co. was Clyde D. Lowry's 2,213,402 for a bar for joining two sheets of glass at a corner.

Patent 2,214,004 assigned to General Ice Cream Corp of Schenectady by Harry L. White and John A. Keenan claims a nondrip milk bottle. The top is flat edged and a vertical pouring lip is covered with a colored ceramic glaze.

A glass vacuum bulb was covered by patent 2,215,798 granted to Hans Schedel of Stuttgart, Germany.

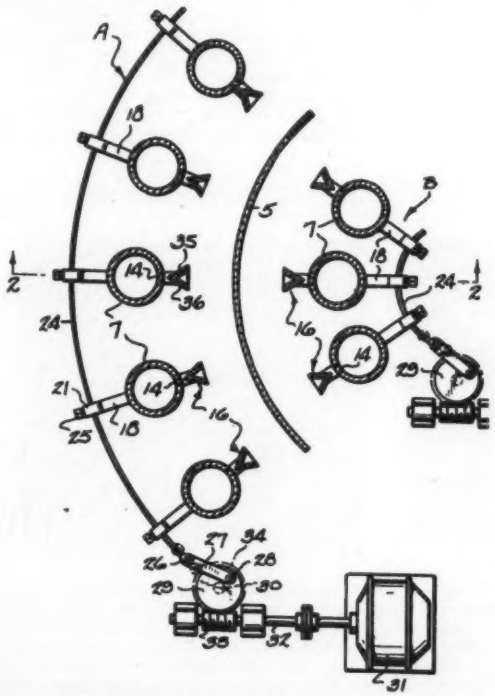


Fig. 6. 2,213,405: Paddock. In tempering curved sheets 5, tubular blowers 7 cool both sides while distributors 16 oscillate in front of the blower outlets.

"HISTORY OF GLASS"

from THE WORLD'S FAIR *donated to* CHICAGO MUSEUM

Famous miniatures are now housed where they can tell the story of glass making to millions of Americans.

The famous "History of Glass" that has been an outstanding feature of the World's Fair, has been permanently donated to the Museum of Science and Industry, Chicago. The "History of Glass" consists of a series of twenty large glass retorts, each containing beautifully carved miniatures, only a few inches in height, that depict the growth of glassmaking from primitive times to the making of industry's most modern product, fiber glass. It has attracted the interest of 12 millions of visitors to the Glass Center during the past two years, and many requests were received by Glass Incorporated for the exhibit to be loaned to various institutions.

Another exhibit, the "Characteristics and Properties of Glass," will also be sent to Chicago with the "History of Glass." This consists of a series of eight animated displays demonstrating the different properties of glass.

1. NATURE'S GLASS

2. DISCOVERY OF GLASS

3. PRACTICAL SPECIMENS

4. INVENTION OF THE BLOW

(1) Obsidian was early used by the Egyptians and Romans. It is opaque, usually dark in color and bears little resemblance to glass as we know it today. (2) According to legend, becalmed Phoenician sailors used soda blocks from their cargo to support cooking utensils. Wood ashes, sand from the shore, and the soda, melting in the fire, combined to be a crude form of glass. (3) Small vases made by winding glass strands around a removable sand core were made in Egypt about 1500 B.C. They were used to catch mourners' tears and often had upon them the departed King's name sign in enamel. (4) The Third Century B.C. marks the invention of the blow pipe which made it possible to make glass transparent and light and to make objects of quite large size. The development of the art of glass blowing showed the real capabilities of the material.

5. COLORED GLASS

6. 16th CENTURY VENETIAN

7. STAINED GLASS WINDOWS

8. INVENTION OF MIRRORS

(5) Cameo vases were made by superimposing one color glass upon another: the outer layer then being deftly cut away as in the case of the ordinary cameo. These vases were more precious than gold and jewels and were possessed only by Nobles and persons of great wealth. (6) Glass makers of Venice developed great skill and artistry. Their secret processes were jealously guarded by the government and glass blowers were not permitted to leave the country under severest penalty. (7) In the Middle Ages stained glass formed an important part of the interior color decoration without which no church was considered complete. Thousands of pieces of white and colored glass were fitted together like a puzzle by the artist-workmen, and joined by grooved strips of lead. (8) Before the year 1500, mirrors were made in Nuremberg by blowing into a glass bubble while still hot, a metallic mixture with a little resin. The bubble was then cut into small round convex mirrors.

ENTION OF OPTICAL GLASS

10. PLATE GLASS

11. CUT GLASS

12. FIRST AMERICAN GLASS

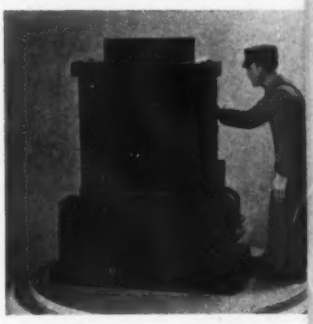
(9) As early as 1292 the writings of Roger Bacon mention spectacles. With the invention of printing in the middle of the 15th century, demands for spectacles and eye glasses increased greatly. Bifocals were said to have first been made for Benjamin Franklin about 1760. (10) In 1688, at a mirror factory near Cherbourg, France, Louis Lucas devised a method of casting glass to form plate glass. The molten glass was poured upon frames, spread out evenly by rollers and subsequently polished. (11) From the earlier art of carving rock crystal in which the Italians had specialized, developed the art of glass cutting which reached its height in the 17th Century when the Schwandhardt's, father and son, of Nuremberg, turned out their masterpieces. Deep cutting was done with the apex of a natural crystal, while the lighter etching was made with a splinter or fragment of a diamond. (12) The first industry on American soil was a glass factory at Jamestown, Virginia, settled in 1608. Beads were made to barter with the Indians, and its operators were fortunate enough to escape massacre in 1622.

BLOW RLY AMERICAN GLASS

14. THE LIGHT BULB

15. AUTOMATIC BOTTLE MACHINE

16. WINDOW GLASS



(13) Caspar Wistar founded the glass industry in the American Colonies in Salem County, N. J., in 1739. Henry William Stiegel laid out the village of Manheim, Pa., and built a factory there in 1765. In 1826 the Boston and Sandwich Glass Co. was incorporated. In 1795 was built the first glass factory west of the Allegheny Divide. (14) In 1879 Thomas Edison produced the first electric light bulb in his own laboratory in Menlo Park. A "free blown bulb" was first made in two parts so that the filament could be changed periodically. (15) Glass was first handled mechanically when this crude device was invented by Michael J. Owens. (16) By the Eleventh Century, Venice became known for its window glass—a fairly clear product made from handblown cylinders. 1902 marks the earliest of the modern methods—that of drawing a continuous flat ribbon of glass vertically upward from the molten glass.

RROR EAT RESISTANT GLASS

18. SAFETY GLASS

19. GLASS BUILDING BLOCKS

20. GLASS FIBER PROCESS

(17) Heat resistant glass was developed for cooking purposes and has been further developed for industrial use. (18) When a test tube containing a film of Cellulose was accidentlly dropped, and failed to fly into countless pieces, the idea for safety glass was born. First patented in 1906 by John Crewe Wood, today's safety glass contains a thin adhesive plastic material sandwiched between two layers of glass. (19) Practical glass block for all types of construction were first offered the building industry seven years ago. They introduce a new light control and insulation medium which is both sturdy and attractive. (20) The method of making glass fibers known as "Fiberglas" was accidentally discovered in 1934 while experiments were being made on an entirely different product. The insulating efficiency of fibreglass is so high that its application to industrial uses appear to be practically unlimited.

LECTURE COURSE ON GLASS AT TOLEDO UNIVERSITY

During the 1940 Fall Term at Toledo University, Delos M. Palmer, Dean of the College of Engineering, has instigated and organized a lecture course on subjects related to glass and its manufacture. The course began on September 18th and will end with an inspection trip through the plants of the Libbey-Owens-Ford Glass Co. on Jan. 15th. Following this will be a review and examination. The course has been very successful so far and may become an annual feature at the University.

The title of the course is "Elements of Glass Technology" and the program and list of speakers follow.

Date	*Topic*	*Speaker*
Sept.		
16	History—Ancient	H. W. Hess Consulting Engineer
25	History—Modern	H. W. Hess Consulting Engineer
Oct.		
1	Glass Exhibit at the Toledo Museum of Art	Miss Nell Jaffe
9	Men of the Glass Industry	E. Berry Libbey Glass Co.
16	Research in Glass	U. E. Bowes O-I Glass Co.
23	Inspection of the Libbey Glass Co.	
30	Chemistry of Glass	J. C. Potts O-I Glass Co.
Nov.		
6	Chemistry of Glass	J. C. Potts O-I Glass Co.
13	Physics of Glass	Clarence Babcock O-I Glass Co.
20	Glass Furnaces and Combustion	F. G. Schwalbe Toledo Engineering Co.
27	Glass Furnaces and Combustion	F. G. Schwalbe Toledo Engineering Co.
Dec.		
4	Glass-Making Machinery and Devices for Flat Ware	J. L. Drake L-O-F Glass Co.
18	Topic to be announced	
Jan.		
8	Characteristics of Automotive Safety Glass	G. B. Watkins L-O-F Glass Co.
15	Inspection of the Libbey-Owens-Ford Glass Co.	

B&L REFUTES ATTACKS ON PATRIOTISM

Defending its 87-year-old record on national defense, the Bausch & Lomb Optical Co., Rochester, N. Y., has issued a book containing laudatory letters from Secretaries Stimson and Knox of the War and Navy Departments. It refutes attacks on the company's loyalty and patriotism engendered by the indictment which charged restraint of trade in military optical instruments.

Mr. Stimson said "relations between Bausch & Lomb and the War Department, extending over a long period of years, have been most satisfactory from every standpoint. At this critical time, the War Department has complete confidence in your company for excellence of workmanship, productive ability and patriotic cooperation."

Although the government case was settled in July by common consent, recurrent attacks accusing the company and its officers of Nazi sympathies and ascribing sinister motives have continued, the statement asserts.

In the opinion of high military authorities, the company states, the agreement between Bausch & Lomb and Zeiss, made in 1921, was beneficial to the armed services of the United States. "The flow of engineering services was all from Germany" and not from the United States.

The Zeiss relationship had been unsatisfactory since 1933, the company statement declared, and when war broke out in Europe the American company notified Zeiss that it considered the contract suspended. Since then it has withheld royalties.

"The contract has had no effect on deliveries to the Army and Navy, nor has Zeiss ever had a voice in the determination of prices charged the Army and Navy for military optical instruments manufactured by Bausch & Lomb," the statement declared.

Denying that the contract had resulted in a monopoly or created exorbitant prices, the company asserted that prices were for the most part the result of vigorous competitive bidding. "Over a nineteen-year period," said the statement, "our military division has shown a small but actual net loss."

Outlining its services in previous wars, the company said it had broken a foreign monopoly on optical glass during World War I and has persisted in further development of its research and facilities, although this material could have been imported at lower costs from abroad.

Asserting that it is wholly American in ownership, management and control, the company said that its record in past emergencies and the enormous obligations it has assumed in the present emergency should be convincing evidence of its entire loyalty to the United States.

NEW SUITS KEEP DIVERS WARM

The U. S. Navy Department has announced the adoption of Fiberglas as standard insulating material for the deep-sea divers. The announcement was made during a demonstration of the new suits held in the headquarters office of the Navy's Experimental Diving Unit in the Washington Navy Yard, under the supervision of Lieut. Commander J. B. Renn. Rear Admiral George T. Pettengill, Commandant, Washington Navy Yard, attended the demonstration of this new underwater safety device. Mr. Paul Gayne, president of the Colvinex Corporation, New York City, the developers and manufacturers of the new suits, also was present.

By use of the new suits, Navy divers now can use the superior helium-oxygen diving gas to make deeper and more effective dives. They can descend to depths greater than 240 feet without suffering from the increased cold which the use of helium produces.

CURRENT STATISTICAL POSITION OF GLASS

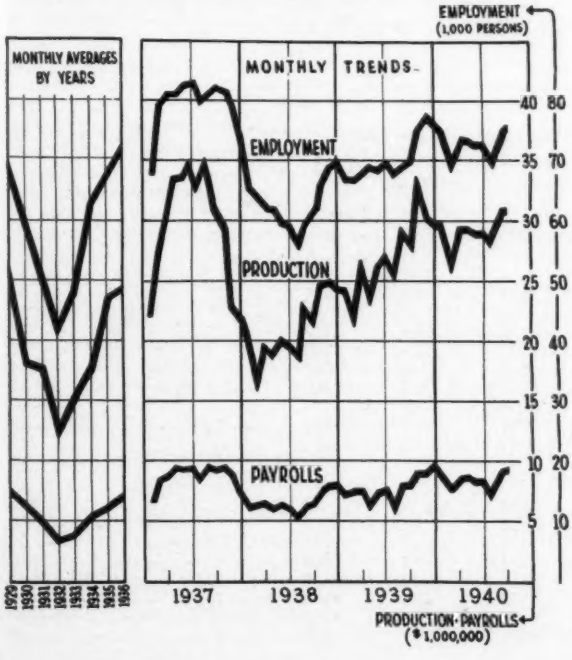
During September, activity in the glass industry continued at a high rate despite seasonal decline in the important container branch. Slight increases were reported for employment and payrolls; export volume declined somewhat but maintained recent high levels as imports dropped to a new low. According to the GLASS INDUSTRY'S Production Index, output during September equaled the August figure of $31,000,000; the cumulative total for the January-September period is placed at $264,000,000 which represents an increase of 15 per cent over 1939.

Plate glass production during September totalled 14,090,796 square feet according to the Plate Glass Manufacturers of America. This was an increase of 12 per cent over August and was 3 per cent above the total reported for September of last year. During the first nine months of 1940 output of plate glass amounted to 113,751,000 square feet which indicates that this year's activity is running about 28 per cent ahead of last year; it is 27 per cent behind the industry's record established in 1936.

Window glass production during September totalled 1,001,979 boxes, having risen 1 per cent above August's figure. Compared with September 1939, this represented a gain of 10 per cent. During the January-September period of this year, window glass output amounted to 9,608,154 boxes—31 per cent more than last year's comparable figure.

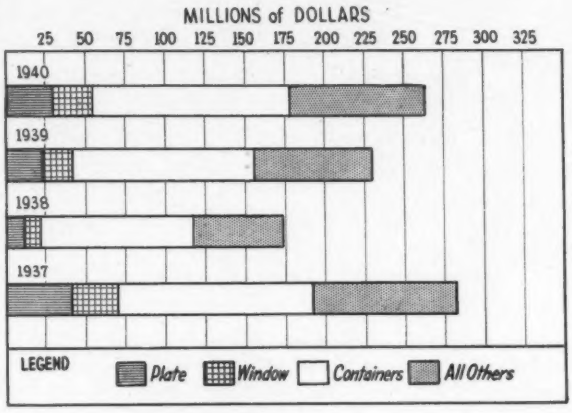
GI THE GLASS INDUSTRY'S INDEX

Monthly Trends Through September, 1940



GI THE GLASS INDUSTRY'S INDEX

Production for Nine Months, January Through September



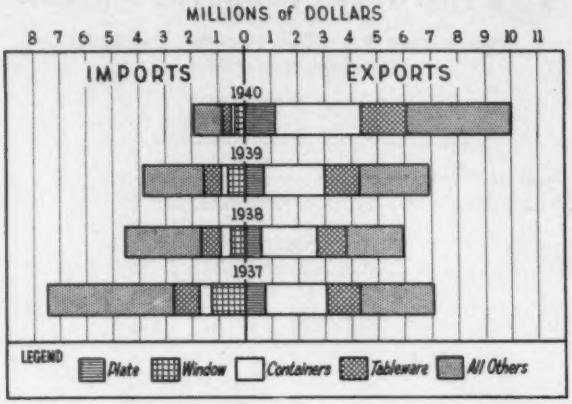
Glass container production during September dropped 5 per cent below August to 4,289,373 gross according to the Glass Container Association of America. All lines, with the exception of pressure and non-pressure ware beer and milk bottles, followed this seasonal industry trend. Output of food containers dropped 27 per cent, but proprietary liquor and general purpose ware were only 1 per cent below the August level. Compared with September of last year, production increased 1 per cent during the month under review. Food, liquor and milk containers were the exception to this trend; pressure and non-pressure output was up 43 per cent, beer bottles and general purpose ware, 22 per cent, and ware, 7 per cent. Cumulative figures for the first 9 months of 1940 indicate that glass container production is running 8 per cent ahead of last year and within 2 per cent of 1937's record figure.

Shipments of glass containers during September dropped 2 per cent below August to 4,564,643 gross. All types, with the exception of liquor and general purpose ware (which increased 61 per cent and 3 per cent respectively) followed the industry trend. Pressure and non-pressure ware declined 55 per cent, beer bottles 51 per cent, proprietary ware 6 per cent and food containers 4 per cent. No change was noted in the milk bottle sales. Compared with September 1939, shipments increased 8 per cent. Proprietary ware (down 12 per cent) and food containers (down 11 per cent) were the only exceptions to this trend; beer bottles were up 27 per cent, pressure and non-pressure bottles 5 per cent and liquor ware 1 per cent. Of September's total shipments, food containers comprised 32 per cent, proprietary ware 31 per cent, liquor ware 18 per cent, general purpose ware 7 per cent, milk bottles 5 per cent, pressure and non-pressure bottles 4 per cent and beer bottles 3 per cent. Shipments for the nine months' period were 8 per cent ahead of 1939 totals.

Stocks on hand at the end of September totalled 9,272,289 gross, which was a drop of 4 per cent below

THE GLASS INDUSTRY'S INDEX

Foreign Trade for Nine Months, January Through September



August's figures. Increases of 9 per cent in pressure and non-pressure ware and 8 per cent in beer bottles were noted, otherwise individual lines followed the industry pattern. A 20 per cent increase was reported over September 1939 totals, which reflected the larger inventories of all type of containers which the industry is maintaining.

Miscellaneous glass products manufactured during September were valued at $12,000,000, according to reliable estimates. This 20 per cent increase over August is attributed to stepped-up activity in plants producing table ware, illuminating, technical, scientific and industrial ware. Gains in handmade glassware factories have been particularly noticeable. On the basis of 9 months' totals, this branch of the glass industry has increased its output by about 20 per cent over last year.

Employment and Payrolls: Approximately 76,000 persons were employed in the glass industry in September as compared to 75,500 in August. In September 1939 employment was estimated at 70,000 persons.

Payrolls during September increased about 3 per cent over the August figure to $8,800,000. This compares favorably with September of last year when payrolls totalled $7,700,000. During the first 9 months of 1940 glass manufacturers paid out over $74,000,000 in wages to their employees ass compared to $65,000,000 last year.

Foreign Trade: Exports of glass and glass products during September were valued at $1,108,000. This was 11 per cent less than in August and 4 per cent below September 1939 (which was the beginning of the war-stimulated export boom). All lines did not follow this general pattern; comparison of September and August totals showed increases of 29 per cent for plate glass, 21 per cent for window glass, and 7 per cent for tableware. Gains over September 1939 were indicated for window glass (up 2166 per cent) and illuminating ware (up 13 per cent). Combined totals for the January-September period place the 1940 export trade at $9,987,000, which is 43 per cent greater than last year. All types of glass contributed to this upturn; window glass was up 1020 per cent, plate glass and illuminating ware 64 per cent, containers 38 per cent, and tableware 27 per cent.

Imports of glass and glass products during September dropped 10 per cent below August to a new low of $157,000. Slight increases were reported for tableware, illuminating ware and plate glass, but these were counteracted by the 73 per cent drop in window glass. A decrease of 60 per cent was indicated by comparison of this September with September of 1939. The exception to this industry trend was plate glass which showed an increase of 17 per cent. Cumulative figures for the first nine months of 1940 show that imports were valued at $1,963,000 or 48 per cent less than in 1939. Here again, plate glass went contrary to the trend with a jump of 143 per cent. Illuminating ware was down 83 per cent, containers 51 per cent, window glass 50 per cent, and tableware 46 per cent.

UNITED STATES FOREIGN TRADE IN GLASS
(Values in Thousands of Dollars)

	1940			1939		Percentage Changes		
	September	August	Nine months	September	Nine months	August-September	September-September	Nine months
EXPORTS								
Plate	124	96	1123	149	686	+29	— 17	+ 64
Window	68	56	336	3	30	+21	+2166	+1020
Containers	280	443	3211	390	2329	—37	— 28	+ 38
Tableware	172	168	1714	215	1350	+ 2	— 20	+ 27
Illuminating Ware	52	63	511	40	312	—18	+ 30	+ 64
All Other	412	419	3092	363	2260	— 2	+ 13	+ 37
Total	1108	1245	9987	1160	6967	—11	— 4	+ 43
IMPORTS								
Plate	7	..	117	6	48	....	+ 17	+ 143
Window	12	45	329	60	660	—73	— 80	— 50
Containers	8	13	124	15	254	—38	— 47	— 51
Tableware	20	18	354	62	650	+11	— 67	— 46
Illuminating Ware	7	6	56	22	332	+17	— 69	— 83
All Other	103	93	983	226	1862	+10	— 56	— 47
Total	157	175	1963	391	3806	—10	— 60	— 48

NEW EQUIPMENT AND SUPPLIES

LYNCH MODEL "16" MACHINE

Ruggedness and precision go hand in hand in design and construction of the new Model "16" machine now being introduced to the glass industry by the Lynch Corporation of Anderson, Ind. Range of ware from 12 ounce capacity to 128 ounce capacity indicates its versatility and flexibility. It is ideal for heavy soda bottles or wine bottles with push-up bottoms, also half gallon and gallon single handle packers.

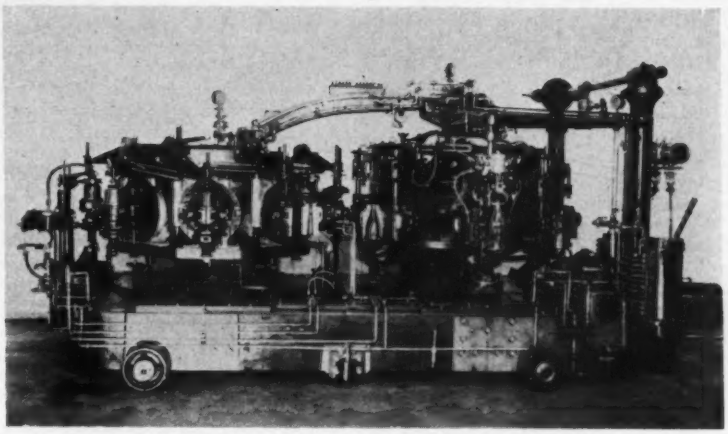
This new machine is equipped with a variable speed drive which permits the operator to speed up the machine, or slow it down, as necessary, to suit the particular job. This results in increased production, better distribution, convenient control, attractive ware, and greater flexibility. The "16" machine is a combination of the Lynch "10" machine and the Miller "JP" electric driven Geneva movement and timer arrangement. This combination offers correct timing of the different operations and when timer buttons are spaced properly accurate functioning is assured. Every known safety device is incorporated as well as other engineering features that make the new model a complete and satisfactory machine to meet the most exacting demands.

The "16" machine carries 8 blank molds on one table and 8 blow molds on the other. Each blank mold carries its own plunger and the baffle while each blow mold carries its own blowhead. This arrangement permits the blowing and working of the glass during the rotating and dwell periods, and also makes it possible to produce at the same time different shaped bottles and finishes, providing weight is the same.

It has been pointed out by the Lynch Corporation that the new "16" machine is designed in such a way that molds made for the Lynch "10" machine will fit the "16" machine without alteration. It is also possible to use blow molds and bottom plates of the older Lynch models, namely: LA, LB, R and RS on the "16" machine, but impossible to use the blank molds, plungers and finish rings, due to the different construction and method of attaching same. It is not necessary or essential for a customer to purchase new mold equipment for the model "16" machine, but the Lynch Corporation points out that it is possible to obtain better ware and greater production when using new molds . . . molds made heavier for the higher speeds that are obtainable.

CATALOG & BULLETIN SERVICE

Current catalogs and manufacturers' service bulletins reviewed in this department may be obtained by writing to THE GLASS INDUSTRY.



Lynch Corporation's New Model "16" Machine

CATALOGS RECEIVED

B. F. Goodrich Co., Akron, Ohio. A bulletin on the applications of Vibro-Insulators which are used to eliminate vibration on motor bases, compressors, and heavy machinery.

Lancaster Iron Works, Lancaster, Pa. Bulletin supplement 70-E. The Lancaster Model PC for laboratory mixing purposes. Designed in response to requests for a table unit with the same mixing system as the larger Lancaster Mixers.

A. P. Green Fire Brick Co., Mexico, Mo. A folder on 'Sairset, an air-setting, high temperature, bonding mortar for fire brick linings.

Reinhold Publishing Corp., New York City. The 25th annual edition of the Chemical Engineering Catalog, inaugurated by the American Institute of Chemical Engineers in 1915. The Catalog is a standard reference work for chemical engineers, factory managers, operating executives and purchasing agents.

Elastic Stop Nut Corp., Union, N. J. A folder containing an explanation of the construction and self-locking action of Elastic Stop Nuts with a graphic listing of their uses.

General Electric Co., Schenectady, N. Y. Bulletin's GEA-3436, the Reactrol System for temperature control; GEA-3434, "900 Series" high-speed synchronous motors; GEA-1755C, Photoelectric relays and accessories; GEA-3191, A-C Magnetic Control for material-handling equipment.

"RED DEVIL" VACUUM HOLDER

A new style vacuum cup holder has recently been placed on the market by Landon P. Smith, Inc., Irvington, New Jersey. The device literally puts a handle on all kinds of glass as well as marble, granite and various smooth-surfaced articles whose weight makes lifting or carrying awkard and difficult. The holders come in three models, and with a chromium-finished body and 5/16 inch thick base of tough, durable rubber. The swivel handle with rubber grip is designed for easy carrying in any position.

"Red Devil" Vacuum Holder

BROWN "PROTECTOGLO"

The Brown Instrument Company, Philadelphia, Pa., announces a method of protection against failure of oil, powdered coal, and luminous gas flames by the recently developed Protectoglo, photo-electro system. The principle used in the new unit avoids the necessity of placing a metallic electrode in the high temperature flames and detects the presence of a flame by means of the light emitted when a burner is in normal operation.

The heart of the system is essentially a light-sensitive device. In operation, the light from the flame is directed upon a photo cell. This results in a small flow of current through the cell which is amplified by a vacuum tube circuit until of sufficient magnitude to close a relay. Through the relay con-

tacts, the main fuel valve is energized. The response of the system to flames of different luminosity may be changed on the job by means of a sensitivity adjustment.

NEW SPRAY GUN MODEL

The O. Hommel Co., Pittsburgh, Pa., has announced the introduction of a new model "Kingbee" spray gun. This new model is suitable for spraying wide surfaces. Besides a wider spray, allowing for greater efficiency, the new gun has a finer atomization, speedier distribution of material, is easily cleaned, will not clog, is sturdily constructed and will resist a great deal of wear with a minimum of repair. Further information may be obtained from the O. Hommel Company.

NEW THERMOCOUPLE FITTING

To facilitate thermocouple replacement, a universal union for angle-type couples has been adopted by the Leeds & Northrup Co., Philadelphia. The two halves of this union fit snugly together in a ground joint making it vapor- and fume-tight. By unscrewing a single clamping nut, the thermocouple's hot leg can be detached; or it can be rotated to any angle between 90 and 180 degrees, and locked firmly in place.

L & N Thermocouple fitting

CUTLER-HAMMER UNITROL

A new engineering idea in motor control installation, built on the same principle as the sectional filing cabinets, has been placed on the market by Cutler-Hammer, Inc., Milwaukee, Wisconsin. This development permits all needed types of control devices to be organized in locker-like Motor Control Centers instead of the usual "pillar and post" method of mounting.

The standardized construction allows quick building up of any Unitrol control center to meet present requirements without special engineering. Changes due to expansion or changes in layout can be taken care of by adding or removing sections, or by replacing the unit controllers. These sections are made in different sizes, for mounting any desired combination of units. A descriptive booklet is obtainable from the manufacturers.

NEW ABRASIVES

"Controlled Abrasives" is claimed by the National Metal Abrasive Co., Cleveland, to be a revolutionizing step in the manufacture of steel shot and grit. By a new process what formerly was merely "shot and grit" has now been so controlled that each size is given the processing that will produce the maximum degree of toughness and hardness in relation to its size.

It is claimed that by controlling the degree of hardness-toughness, entirely different results are obtainable. In fact, shot and grit can now be bought that will give the most advantageous results, just as it is possible to buy steel according to specification for the respective uses to which it is to be placed.

EXPORT BOOKLET ON REFRACTORIES

"World-Wide Refractories Service" is the title of a forty-eight page export booklet just issued by General Refractories Company, Philadelphia. This book is printed in both English and Spanish, contains color throughout, and has sixty-five illustrations in addition to thirty technical drawings of brick shapes and sizes. It covers descriptive information on all the major types of refractories and their uses, describes methods of shipment for export and incorporates ten pages of such tables of sizes, weights, volumes and general data as are usually required in the use, application and purchase of refractories.

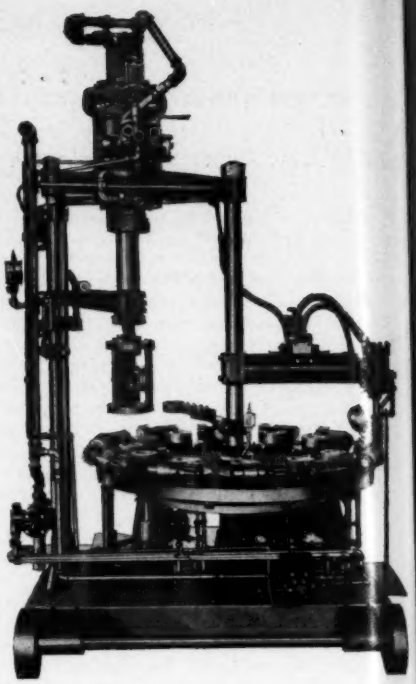
FURNACE PRESSURE CONTROL

To describe important new features of its Furnace Pressure Control system, which has just been extensively redesigned, the Leeds & Northrup Company, Philadelphia, has issued a 12-page catalog, "Furnace Pressure Control for Metallurgical and Other Industrial Furnaces," N-01A-600.

Fully illustrated, this booklet presents for the first time an L&N industrial furnace pressure controller which has its mechanism housed in a flush-mounting, instrument-type case with a built-in selector switch, push-button station and handy control-setting device. The catalog shows features said to enable the user to obtain exactly the sensitivity his particular furnace conditions require. Details of design and construction which minimize maintenance are described, along with a compact control panel on which the controller and all accessories, except drive-unit, are mounted and fully wired at the factory.

WALSH OFFICES MOVED

The Walsh Refractories Corporation announces the change of their general offices from 4428 North First Street to 4070 North First Street, St. Louis. Increased production and additional new equipment necessitated moving the offices from the factory proper.



Miller PBS Press

NEW MILLER PBS PRESS

The illustration shown here is the Miller PBS press. This machine is manufactured by the Lynch Corporation of Anderson, Indiana, and when equipped with dumping baskets offer advantages over and above plain mold bases.

For ware that does not require a valve in the mold, dumping baskets are used. They are used for glass caps, small lenses, coasters, and the like. When the dumping baskets are removed from the table, the press can be arranged to use mold bases for making block, or jointed mold ware. In other words, the PBS is a two purpose press and it is ideal for making small pressed ware.

The press is pneumatically operated and can be indexed six ways as well as twelve ways. While the cut shows the air driven press, the same machine is also available in motor driven.

LIGHT-WEIGHT RESPIRATOR BY WILLSON PRODUCTS

Willson Products, Inc.. Reading, Pa., have recently put into the market a new light-weight respirator, said to be the lightest weight throw-away filter-type to receive the U. S. Bureau of Mines approval, number 2140. The number 5, as this new respirator is called, is approved for protection for a great variety of dispersoids classified by the U. S. Bureau of Mines as pneumoconiosis-producing dusts and mists; also, nuisance dusts and mists and chromic acid mist.

CURRENT PRICES OF GLASS-MAKING MATERIALS

FURNISHED BY PRODUCERS, MANUFACTURERS AND DEALERS

Base Materials

		Carlots	Less Carlots
Barium carbonate ($BaCO_3$), Crude, (Witherite) 90%, 99% through 200 mesh	ton	43.00	46.00-49.00
Reduction on precipitated material, $5.00 a ton			
Barium sulphate, in bags	ton	19.00	24.00
Barium sulphate, glassmaker's, carlots, bulk f. o. b. shipping point	ton	15.00-16.00	18.00
Borax ($Na_2B_4O_710H_2O$)	lb.	....	....
Granulated	In bags, lb.	.0215	.027-.0295
Powdered	In bags, lb.	.024	.0295-.032
Boric acid (H_3BO_3) granulated	In bags, lb.	.048	.054-.0565
Calcium phosphate ($Ca_3(PO_4)_2$)	lb.	.07	.07½
Cryolite (Na_3AlF_6) Natural Greenland (Kryolith)	lb.	.0865-.0875	.0925
Synthetic (Artificial)	lb.	No supplies available.	
Feldspar—(published list prices)			
20 mesh	ton	11.00-13.25	
40 mesh	ton	11.50-13.75	
Granular	ton	11.75-14.00	
Semi-granular	ton	11.00-13.25	
L. C. L., (Min. 2 tons) $3.00 per ton additional plus charge for bags			
Fluorspar (CaF_2) domestic, ground, 96-98% (max SiO_2, 2½%)			
Bulk, carloads, f. o. b. mines	ton	29.00-30.00	....
In bags	ton	30.60-31.60	42.00-45.00
Kryolith (see Cryolite)			
Lead Oxide (Pb_3O_4) (red lead) (N. Y.)	lb.	.08	....
In 5 Ton lots	lb.	....	.085
Less than 5 Tons	lb.	....	.09
Lime—			
Hydrated ($Ca(OH)_2$-MgO) (in paper sacks)	ton	8.50	8.50
Burnt (CaO-MgO) ground, in bulk	ton	7.00	....
Burnt, ground, in paper sacks	ton	9.00	9.00
Burnt, ground, in 180 lb. drums	Per drum	1.60	1.70
Kiln Dried ($CaCO_3$-$MgCO_3$) 10x30 mesh	ton	1.75	....
Kiln Dried ($CaCO_3$-$MgCO_3$) 16x120 mesh.	ton	1.75	....
Nepheline Syenite, f. o. b. shipping point	ton	12.00	15.00
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.065	.0675
Hydrated 80-85%	lb.	.055	.0575
Salt cake, glassmakers (Na_2SO_4)	ton	18.00-20.00	25.00
Soda ash (Na_2CO_3) dense, 58%—			
Bulk	Flat Per 100 lb	.95	....
In barrels	Per 100 lb.	1.35	....
In bags	Per 100 lb.	1.10	....
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	Per 100 lb.	....	2.50-2.90
95% and 97%			
Bulk	Per 100 lb.	1.35	....
200 lb. bags		1.44	1.465
100 lb. bags		1.475	1.50

Special Materials

		Carlots	Less Carlots
Aluminum hydrate (Al $(OH)_3$)	lb.	.026-.029	.04
Aluminum oxide (Al_2O_3)	lb.	.07	.09
Antimony oxide (Sb_2O_3)	lb.	.14	.14½
Arsenic trioxide (As_2O_3) (dense white) 99%	lb.	.03¼	.03¾
Barium nitrate ($Ba(NO_3)_2$)	lb.	....	Open price.
Pyrophyllite, (20% Al_2O_3)	ton	9.00	12.00
Sodium fluosilicate (Na_2SiF_6)	lb.	....	.09-.09½
Tin Oxide (SnO_2) in bbls.	lb.	....	.54
Titanium Oxide (ceramic grade)			
In bags	lb.	.12	.12¼-.12¾
In barrels	lb.	.12¼	.12½-.13
Zinc Oxide (ZnO)			
American process, Bags	lb.	.06½	.06¾
White Seal, 150 lb. bbls.	lb.	.09	.09¼
Green Seal bags	lb.	.08¼	.08½
Domestic White Seal bags	lb.	.08¾	.09
Red Seal, bags	lb.	.07¾	.08
Zircon			
Refined Granular (Milled .01-.02c higher)		.06½	.07-.08

Coloring Materials

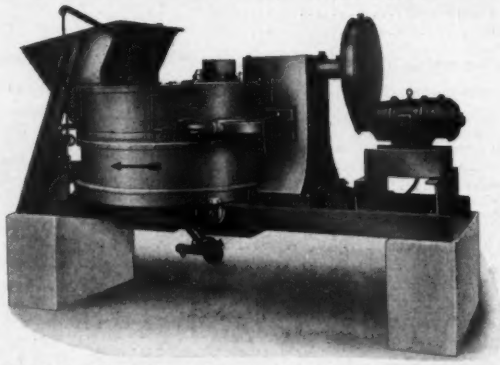
		Carlots	Less Carlots
Barium selenite ($BaSeO_3$)	lb.	....	1.40-1.60
(Commercial, 25% Selenium)	lb.	....	.85
Cadmium sulphide (CdS)	lb.	....	1.00-1.05
Cerium hydrate—			
100 lb. drums and 600 lb. barrels	lb.	....	.60
Chrome Oxide Green, 400 lb. bbls.	lb.	....	.22-.25
Chromite (99% through 200 mesh)	ton	41.00	45.50
Chromite ore (air floated)	ton	55.00	58.00-73.00
Cobalt oxide (Co_2O_3)			
In bbls.	350 lbs. or more, lb.	....	1.84
	Less than 350 lbs., lb.	....	1.94
Copper oxide—			
Red (Cu_2O)	lb.	....	.165
Black (CuO)	lb.	....	.18-.19
Black prepared	lb.	....	.22
Iron Oxide—			
Red (Fe_2O_3)	lb.	....	.05-.09½
Black (Fe_3O_4)	lb.	.04½	.09
Iron Chromate	lb.	....	.035-.05
Lead Chromate ($PbCrO_4$) in bbls.	lb.	....	.135
Manganese, Black Oxide (Caucasian)			
In Paper bags	ton	70.00	78.00
In Burlap bags	ton	71.75	79.75
In Casks	ton	74.00	82.00
Neodymium oxalate, 50 lb. drums	lb.	....	3.50
Nickel oxide (Ni_2O_3), black	lb.	....	.35-.40
Nickel monoxide (NiO), green	lb.	....	.35-.37
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals and Granular	lb.	.08¾	.09-.09¼
Powdered	lb.	....	.09¼-.09¾
Potassium Chromate (K_2CrO_4) 100 lb. kegs	lb.	....	.27
Powder blue	lb.	....	.21-.25
Rare earth hydrate—			
100 lb. drums	lb.	....	.35
325 lb. barrels	lb.	....	.30
Selenium (Se) In 100 lb. lots	lb.	....	1.75
In lesser quantities	lb.	....	1.85
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.06¾	.07-.07¼
Sodium chromate (Na_2CrO_4) Anhydrous	lb.	.08½	.08½-.08⅝
Sodium selenite (Na_2SeO_3)	lb.	....	1.50-1.65
Sodium uranate (Na_2UO_4) Orange	lb.	....	1.75-1.85
Yellow	lb.	....	1.75-1.85
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.35	3.70-4.10
Flowers, in bags	Per 100 lb.	3.00	3.35-3.75
Flour, heavy, in 250 lb. bbls.	Per 100 lb.	2.90	3.25-3.65
Uranium oxide (UO_2) (black, 96% U_3O_8) 100 lb. lots. Black	lb.	....	2.65-2.75
Yellow orange	lb.	....	1.75-1.85

Polishing Materials

		Carlots	Less Carlots
Emery, Turkish	lb.	.063	.07
Pumice Stone,			
American Ground Italian FFF, FF, F	lb.	.... } open	
0, 0½, ½, 1.	lb.	.... } price	
Putty Powder	lb.	Open price.	
Rotten Stone, (Domestic)	lb.	02¼	.03½
Rouge, Red	lb.	....	.16
Black	lb.	....	.18

Lancaster
Counter
Current
Rapid Batch
Mixers

Modern as Today for
GLASS BATCH MIXING



Symbol EMG "Lancaster" Mixer, closed pan type with stationary hopper. Elevator hopper equipment also available.

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CROWNDALE QUARRIES, LTD.

According to a recent dispatch from England, the United Glass Bottle Manufacturers, Ltd., and Pilkington Bros., Ltd., have just registered the title, Crowndale Quarries, Ltd., with a capital of £5,000. The objects of the company are to acquire a sandstone quarry at Crowndale, Flintshire, together with all the equipment and mineral rights and with an option to purchase the surface of adjoining lands. The directors are Messrs. Thos C. Moorhead and John W. Warr, Lawrence H. A. Pilkington and Henry Arnold.

ASTM DISCUSSES GLASS

New techniques in the manufacture and use of Fiberglas and other forms of glass were discussed during a meeting of the New York District Committee of the American Society for Testing Materials held Thursday, October 17, in the Hotel Pennsylvania, New York City. The speakers were James Slayter, vice president of the Owens-Corning Fiberglas Corp., and Dr. George W. Morey of the Geophysical Laboratory, Washington, D. C.

Mr. Slayter's subject was "The Story of Fiberglass, a New Basic Raw Material." He discussed the manufacture and uses of this material for air filters, thermal insulation, electrical insulation and textiles. His talk was accompanied by lantern slides and exhibit.

Dr. Morey's topic was "Glass Other Than Fiberglas." He discussed recent trends and developments in manufacture and technology of glass, particularly the effects of heat treatment on the properties of glass and glass surfaces.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF MARCH 3, 1933.

THE GLASS INDUSTRY, published monthly at 11 West 42nd Street, New York, N. Y., for October 1, 1940, State of New York, County of New York, ss:

Before me, a Notary Public in and for the State and County aforesaid, personally appeared John T. Ogden, who, having been duly sworn according to law, deposes and says that he is the Publisher of THE GLASS INDUSTRY and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: John T. Ogden, 11 West 42nd Street, New York, N. Y.

2. That the owners are: Ogden-Watney Publishers, Inc., 11 West 42nd Street, New York, N. Y.; John T. Ogden, 11 West 42nd Street, New York, N. Y.; Katherine Waller Ogden, 11 West 42nd Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed)

JOHN T. OGDEN, *Publisher.*

Sworn to and subscribed before me this 28th day of September, 1940.

Joseph M. Charlebois, Notary Public
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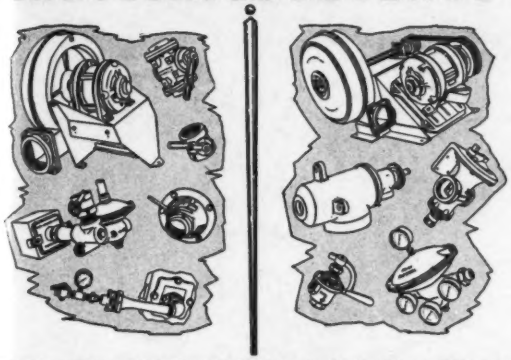

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Our technologists make use of every scientific means to find facts about Drakenfeld colors and chemicals that will make your production easier, more economical. *But, they also know that laboratory knowledge must be backed up by the human experience that comes only of actual work in the field.* It's this "know-how," this ability to predict results on the basis of what they've seen happen in lehrs and spraying rooms, that gives added importance to Drakenfeld research.

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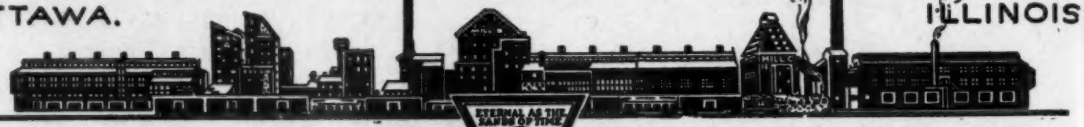

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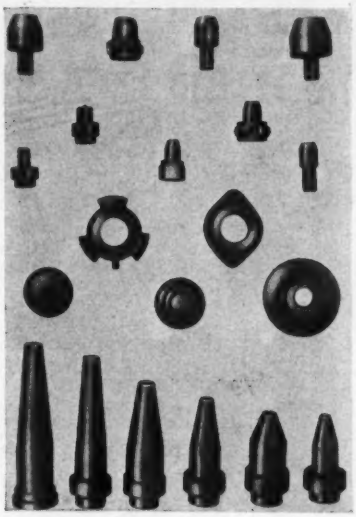

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